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Sport Fishery Abstracts

Vol. 10 No. 4, 1965
Abstracts 7994 - 8300

DEPARTMENT OF THE INTERIOR

Stewart L. Udall, Secretary

U. S. FISH AND WILDLIFE SERVICE

Clarence F. Pautzke, Commissioner

BUREAU OF SPORT FISHERIES AND WILDLIFE

John S. Gottschalk, Director

Use of funds for printing this publication approved by the Director of the Bureau of the Budget January 19, 1966

Washington 25, D. C.

Sport Fishery Abstracts

An abstracting service for fishery research and management

Vol. 10, No. 4 Abstracts 7994 - 8300 1965

Sport Fishery Abstracts is intended to furnish fishery biologists in government agencies and educational institutions with abstracts of the current literature in sport fishery research and management. Abstracts of papers on limnology, ecology, natural history and other fields of specialization will be included when the subject has application to the conservation of sport fish and the restoration of sport fishing.

One volume consisting of not more than four numbers will be issued each year. Each number contains separate Author and Subject indexes, with the final number of each volume containing cumulative indexes. The last number of each volume contains a list of publications screened for appropriate material.

Suggestions for improving the usefulness and coverage of Sport Fishery Abstracts are solicited.

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Prepared in the Division of Fishery Research
George R. Lee, Editor
Ronald C. De Vall, Asst. Editor

CORRECTIONS

Abstract No. 7818 of Volume 10, No. 3, erroneously listed as "Anonymous" the author of LIFE HISTORY AND MIGRATION PATTERNS OF ARCTIC GRAYLING. Alaska Dept. of Fish and Game Research Report No. 2, 30 p. The author of that report, Dr. Roger J. Reed, is now Assistant Leader, Massachusetts Cooperative Fishery Unit.

First abstract number shown on cover and preface page of Volume 10, No. 3, should have read 7755, not 7555.

NOTICE

The format of Sport Fishery Abstracts will be revised beginning with Volume 11. In place of the two-column, 8 x 10-1/2 pages, it will contain single column 6 x 9 pages. The index for Volumes 6 through 10 will be 8 x 10-1/2 to conform with those Volumes. No reduction in the number of abstracts per issue is contemplated.

7994. Tyurin, P. V. 1962. PROSPECTS OF DEVELOPING FISHING INDUSTRY IN RESERVOIRS. (PERSPEKTIVY RAZVITIYA RYBNOI PROMYSHLENNOSTI NA VODOKHRANILISHCHAKH). Rybn Khoz 38(12): 8-12; Biological Abstracts, Vol. 45, No. 20, Abst. No. 85147. 1964.

In 1960 in the USSR, the area occupied by reservoirs exceeded 4 million hectares; by 1965 it will increase to 5.4 million ha. A great number of the larger reservoirs came into service in the last few years and the fish stocks in them are only beginning to form. Data are presented pertaining to the fish productivity of the large reservoirs, and the division of reservoir fish productivity according to geographic zones. Diverse reclamation, conservation, fish-rearing and acclimatization measures are planned. Research is being conducted on the theory and practice of the management of reservoirs. Dams at a number of reservoirs stop the migration of diadromous fish. On the other hand, conditions are created, which are favorable for forming a commercial population of new fish species. By 1965, fish production of reservoirs is planned to reach 100,000 tons with target figure of 200,000 tons later on.--D. E. Bevan.

7995. Vernidub, M. F. 1962. EXPERIMENTAL ANALYSIS OF PROCESSES CAUSED BY POISONING WITH NON-VOLATILE PHENOLS IN BALTIC SALMON IN THE LARVAL PERIOD. (EKSPERIMENTAL'NYI ANALIZ PROTSESSOV, VYZYVAEMYKH OTRAVLENIEM NELETUCHIMI (SMOLYANYMI) FENOLAMI BALTIISKOGO LOSOSYA V LICHINOCHNYI PERIOD ZHIZNI). Uch Zap Leningradsk Gos Univ 311. 153-177; (English summ.); Referat. Zhur., Biol., 1963, No. 6I85. (Translation); Biological Abstracts, Vol. 45, No. 20, Abst. No. 85148. 1964.

A whole series of specific functional disturbances took place in the larva of Baltic salmon under the influence of nonvolatile phenols: the motor activity of the embryo was intensified, changing into a tetanic convulsion of separate groups of muscles or the muscles of the whole body; arrhythmia in the activity of the auricle and ventricle set in, etc. Changes commencing in the larvae under the influence of phenol were phasic in character. In the first phase, mild stimulation of motor activity and of all physiological processes (respiration, growth, erythropoiesis) occurred. Changes produced by the poison in this phase were fully reversible with the transfer of the larvae into clean water. In the second phase of poisoning, the movements of the larvae assumed a confused character. The respiration rate began to decrease. Arrhythmia in the contraction of the auricle set in, and then of the ventricle. The reaction of the larvae to temperature was distorted (they began to move into the warm, and not into the cold zone.) With the transfer of the larvae into clean water, the normal processes of life activity were reestablished, although very slowly. The transition in the third phase was characterized by the beginning of tetanic convulsions of the muscles of the right and left sides of the body, alternately. The capacity for normal movement was lost. Changes which occurred in the vital activity of the larvae in this phase were almost totally irreversible. A weak motor activity and full loss of reactions to all stimuli were characteristic of the fourth phase. The changes which took place during this phase were irreversible. The fifth phase was characterized by complete paralysis and ended in death. The approach and duration of each phase, and then the degree of expression of the disturbances arising in the activity, depended on the individual characteristics of the larvae, temperature of the water and concentration of the phenol. A lethal concentration of phenol was about 1 mg/l. It was discovered that water in the Plyussy River containing sewer water of a gas-shale plant, in May 1958 had as much toxicity as water containing phenol in a concentration of 12 mg/l.

7996. Zharov, V. L. 1961. NOTES ON TUNAS OF THE TROPICAL ATLANTIC (ACCORDING TO DATA OF THE 1959 EXPEDITION). (O TUNTSAKH TROPICHESKOI ATLANTIKI (PO MATERIALAM EKSPEDITSII 1959 g.). Tr Baltiisk Nauchn-Issled Inst Morsk Rybn Khoz I Okeanog 7. 17-30; Referat. Zhur., Biol., 1962, No. 9I23. (Translation); Biological Abstracts, Vol. 45, No. 20, Abst. No. 85152. 1964.

A study was made of the region extending from the equator to 10° N between 10° E and 60° W and the continental shelf of West Africa (Canary Islands - equator) and South America (Recife - Georgetown). Set-line catches yielded 70-80% yellowfin tuna (Neotunnus micropterus), the remainder being bigeye tuna (Thunnus obesus), albacore (T. alalunga), common and skipjack tuna (Katsuwonis pelanus), with rare instances of marlin, sailfish, swordfish, and dolphin. It is likely that bluefin tuna of the western and eastern parts of the region represent a single population. Sex ratio was estimated at about 1:1. Bluefin tuna 50-100 cm in length were almost sexually mature, but they did not spawn; spawning stock consists of fish longer than 120 cm. Spawning in the western part of the region is prolonged. Squid is the principal food, though in the western part fish are also eaten. Feeding is continuous. Concentrations of bluefin tuna are limited to deep waters, and consequently it is difficult to locate them by acoustic apparatus. For this reason, the search for them should be based on hydrological observations.

7997. Levanidov, I. P., and L. K. Bukhryakova. 1963. PHYSICO-CHEMICAL CHARACTERISTICS OF SALMON SPAWN. (FIZIKOKHIMICHESKIE SVOISTVA IKRY LOSOSEVYKH). Izvest Tikhookeansk Nauchn-Issled Inst Rybn Khoz I Okeanog 49: 201-214. From: Ref Zh Biol, 1964, No. 2I60. (Translation); Biological Abstracts, Vol. 45, No. 20, Abst. No. 85266. 1964.

The stability of the egg membrane and the egg yolk were examined. pH of the egg yolk of both species was found to lie in the acid range. Total and protein N were determined, as well as the N and phosphate contents in lipoproteids and phosphoproteids bound to lipoproteids. Salt-soluble egg-yolk lipoproteids had, on the average, 14% N and 1% P. Salt-soluble and water-soluble proteins were found to coagulate at 82-84 and 72-74° C, respectively.

7998. Syrov, V. S. 1963. BIOELECTRICAL STUDIES OF FISH EGGS IN VARIOUS STAGES OF DEVELOPMENT. (K VOPROSU OB IZUCHENII BIOTOKOV V IKRE RYB NA RAZNYKH STADIYAKH RAZVITIYA). Nauchn Tr Ukrainsk Nauchn-Issled Inst Rybn Khoz 15: 75-91; Referat. Zhur., Biol., 1964, No. 1I83. (Translation); Biological Abstracts, Vol. 45, No. 20, Abst. No. 85338. 1964.

A study was made of the bioelectricity in developing eggs of loach (Misgurnus fossilis), Baltic salmon and rainbow trout. Potential differences were determined with the aid of calomel electrodes and a mirror galvanometer or frequency-modulated electrocardiograph. The potential difference was shown to depend on egg size, and was found to be higher in fertilized than in unfertilized eggs. Highest potential difference was observed on removal of the principal egg axis from the poles. During stages of increased differentiation, the fluctuations in potential difference decreased. Floridzin decreased the amplitude of fluctuations in potential difference. Rapid fluctuations were inhibited by KCN.

7999. Borovlev, A. V. 1962. POLLUTION CONTROL OF WATERCOURSES AND PROTECTION OF FISH RESERVES IN THE BURYAT ASSR. (BOR'BE S ZAGRYAZNENIEM VODOEMOV V SVYAZI S OKHRANOI I VOSPROIZVODSTVOM RYBNYKH ZAPASOV V BURYATSKOI ASSR). In: Voprosy okhrany prirody Buryatii. (Problems of nature conservation in Buryatiya). Ulan-Ude. 54-58; Referat. Zhur., Biol., 1963, No. 7D273. (Translation); Biological Abstracts, Vol. 45, No. 20, Abst. No. 87984. 1964.

Pollution from timber processing damages the fishing industry and ruins the water for drinking and agricultural purposes. A number of rivers have completely lost their fishery significance; considerable sections of such primary rivers of Buryatiya, as the Selenga, Barguzin, Upper Angara, and the Kichera have become severely polluted. The unsystematic felling of timber along the banks and the floating of unbarked logs on commercial rivers has especially affected the spawning of fish. The discharge of a considerable amount of domestic sewage and industrial waste waters is also a cause of severe pollution. Purification systems are necessary for industrial waste waters as well as domestic sewage.

8000. Srivastava, P. N., and C. Tachi. (Biol. Div. Natl. Inst. Radiol. Sci., Chiba-Shi, Japan). 1964. SODIUM EXCRETION AS A FACTOR CAUSING DEATH IN FISH DUE TO IRRADIATION. Nature, 202(4938): 1234-1235. Illus.

8001. Dedyu, I. I. 1963. THE RESULTS OF AND PROSPECTS FOR THE SETTLEMENT OF SOME BLACK SEA-CASPIAN AMPHIPODS AND MYSIDS IN LAKES AND RESERVOIRS OF MOLDAVIA. (REZUL'TATY I PERSPEKTIVY VSELENIYA NEKOTORYKH PONTOKASPIISKIKH VIDOV AMFIPOD I MIZID V VODOEMY MOLDAVII). In: Akklimatizatsiya zhivotnykh v SSSR. (The acclimatization of animals in the USSR). Akad. Nauk Kazakhsk. SSR: Alma-Ata. 241-243.; Referat. Zhur., Biol., 1964, No. 1D158. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 89661. 1964.

Acclimatization work has been carried out in Moldavia since 1955. Mysids (Paramysis kowalevskyi, Limnomysis benedeni, and Katamysis warpachowskyi), which are widespread and abundant and which form a substantial part of the diet of many fishes, were imported into the Dubossary Reservoir. The first 2 spp., when transplanted in May 1961, from the Kuchurgan Lowland into the Komrat Reservoir, produced accumulations in some spots of 70-100 specimens per m^2 in the same year. It is shown that the species settled here are reproducing at a high rate and have entered the phyto- and lithorheophilic biocoenoses. The mysids P. kowalevskyi and L. benedeni and the amphipods Pontogammarus robustoides and Dikerogammarus haemobaphes fluviatilis imported from the same lowland into the Gidircheskoe and Kangazskoe reservoirs are eaten by the fish. In addition to the species already settled, the diet can also be enriched by using Pontogammarus obesus, D. villosus bispinosus, Chaetogammarus tenellus behningi, and Diamysis pengoi.

8002. Akhterov, A. Kh. (Helminthol. Lab. Acad. Sci., Moscow, USSR). 1963. HELMINTHS AS BIOLOGICAL INDICATORS OF LOCAL STOCKS OF AMUR ANADROMOUS SALMON (ONCORHYNCHUS). (GEL'MINTY KAK BIOLOGICHESKII INDIKATOR LOKAL'NYKH STAD AMURSKIKH PROKHODNYKH LOSOSSEI (ONCORHYNCHUS)). Vopr Ikhtiol 3(3): 536-555; Biological Abstracts, Vol. 45, No. 21, Abst. No. 89688. 1964.

During the summer-fall period, 1958-1960, 615 fall and summer keta, and 187 pink salmon, from 12 different Amur River Basin points were examined for helminths. Twelve species of helminths belonging to four classes--Trematoda (2), Cestoda (4), Nematoda (4) and Acanthocephala (2)--were found in pink salmon while 11 species belonging to same four classes were found in keta. Serving as indicators of the degree of localization of different groups of salmon are: (1) the number of helminths found on different locality groups; (2) the composition of the helminth fauna by locality; (3) the frequency of infestation (EI) % of group infested by a particular species of helminth and the intensity of infestation (IF) [the number of helminths per specimen]. Summer keta from two different localities, the Ul and My Rivers, had nearly the same number of helminth parasites--10 and 11 species respectively but had different EI's; for Bolbosoma coenoforme, the EI's were 5 and 13%, respectively, for the two groups. In the Amur populations of keta and pink salmon 11 and 12 helminth species were found, while in the South Sakhalin populations, 16 and 19 species were found. Moreover, pink salmon of the Amur population are infested with the nematode Ascarophis skrjabini, while Amur keta are not. Plerocercoids of Eubothrium crassum were found in keta but not in pink salmon. The summer and fall keta population differ in their EI's. All of these findings support the earlier suppositions of the existence of localized, river-specific subpopulations of keta and pink salmon in the Amur Basin. The data also indicate that Amur

Basin salmon also return from the Pacific Ocean for breeding via the Sea of Okhotsk and northern edge of Sakhalin, in contrast to earlier theories of only one return route situated between Sakhalin and Hokkaido. --L. T. Penny.

8003. Bizyaev, I. N. 1962. ON THE INTRODUCTION OF HERBIVOROUS FISHES INTO WATERS OF THE KRASNODAR REGION. (O VSELENII RASTITEL'NOYADNYKH RYD V DODOEMY KRASNODARSKOGO KRAYA). Nauchn-Tekh Byul Gos Nauchn-Issled Inst Ozernogo Rechnogo Rybn Khoz 16. 51-55.; Referat. Zhur., Biol., 1963, No. 19I99. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 89694. 1964.

The results of acclimatization (survival rate, disease rate, acclimatization rate, and growth rate) of grass carp (Ctenopharyngodon idella), and black carp (Mylopharyngodon piceus), silver carp (Hypophthalmichthys molitrix) and bighead(Aristichthys nobilis) in waters of the Krasnodar Region are discussed. The data indicate that A. nobilis is the most suitable species for acclimatization in both the Kuban' River and the freshwater zones of the Sea of Azov.

8004. Bukirev, A. I., and E. A. Zinov'ev. 1962. GRAYLING IN THE CENTRAL KAMA RIVER. (KHARIUS SREDNEI KAMY). Uch Zap Permsk Univ 22(4): 124-130.; Referat. Zhur., Biol., 1963, No. 18I1. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 89695. 1964.

Morphometric investigations were made of 100 grayling specimens (74 females and 26 males) from the Vishera River (tributary of the Kama). The age range was from 2+ to 10+ years, with a predominance of individuals aged 2+, 3+, and 4+. The Vishera grayling differs markedly in a number of morphometric characters from the related species in the Mesna River, and also from the populations in the Kama brooks and ponds. No sexual dimorphism was observed; age and geographical variability were shown to be present. Because of the fall in water level in recent years, the author recommends prohibition of the fishery for grayling in the period 1963-1966 and also prohibition of underwater explosions for the partitioning of rivers by dams.

8005. Chugunova, N. I. 1963. AGE AND GROWTH STUDIES IN FISH. (Translated from the Russian.) iv+132 p. Illus. Available from Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C. Pr. $1.50. Paper; Biological Abstracts, Vol. 45, No. 21, Abst. No. 89699. 1964.

This book is a review of the methods of age and growth determination in fish. Age and growth studies are an extremely important field of commercial fishery biology, knowledge of which is required for the solution of such problems as the population dynamics of fish, assessing of fishing grounds, fishery management techniques, etc. This book gives a fairly comprehensive critical review of the methods of age and growth determination used in this country and abroad, describes the methods of collecting and initial processing of the material and provides an extensive list of Soviet and foreign publications on the subject. The guide is designed for biologists working in this and related fields, and for University and Technical College students. The book may also be of value to administrators and technicians working in the field of commercial fishery reserves. (From forward).

8006. Domanevskii, L. N. (Baltic Res. Inst. Fish. and Oceanog., Kaliningrad, USSR). 1963. A METHOD FOR COMPUTING THE NUMBERS OF PIKE ESOX LUCIUS L. IN THE TSIMLYAN RESERVOIR. (Metodik ucheta shchuki Esox lucius L. Tsimlyanskogo vodokranilishcha). Vopr Ikhtiol 2(3): 513-521. Illus.; Biological Abstracts, Vol. 45, No. 21, Abst. No. 89705. 1964.

The overall and age-group numbers of pike for successive years, (1953-1960) were approximated from sampling and annual catch data. The overall number (N_2) in any one year is: $N_2 = \frac{q_2 C_1}{q_1 - q_2}$, where q_1 and q_2 are the average sample takes in year n-1 and year n, respectively, and C is the commercial catch for the period between the two sampling periods. When the % age-group composition between annual samples is also known, the age-group composition of the catch during the interim period may be found. The annual production of commercial-size fish (P) is: $P = N_2 - (N_1 - C_1)$. Egg production (p) for any year may be found by the formula: $p = Ar$, where A is the weight of sexually mature females and r is the coefficient of egg production. The formulas are suitable for both numerical and weight determinations. Using this method it was found that there is no significant correlation between egg production, the number of offspring and the number of breeders. The factor most limiting the actual number of harvestable fish produced is the conditions affecting the survival of the young. Thus, it was found that the 1952 breeding season produced the largest number of surviving pike, although egg production in that year was the lowest. --L. T. Penny.

8007. Efimov, V. I. 1962. SURVIVAL RATE OF PINK SALMON (ONCORHYNCHUS GORBUSCHA) DURING EMBRYONIC DEVELOPMENT. (VYZHIVAEMOST' GORBUSHI V PERIOD EMBRIONAL'NOGO RAZVITIYA). Nauchn-Tekh Byul Polyarnogo Nauchn-Issled I Proektnogo Inst Morsk Khoz I Okeanogr 4. 22. 25-26; Referat. Zhur., Biol., 1963, No. 21I59. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 89708. 1964.

Incubation of O. gorbuscha eggs at low temperature (below 1° C.) was destructive to the eggs. When the early stages (up to the epithelial blastula stage) occurred at a high temperature (9-6° C.) development proceeded successfully. A moist atmosphere and an elevated temperature are recommended for incubating eggs in the polar region.

8008. Galkina, L. A. (Murmansk Mar. Biol. Inst., Dal'nie Zelentsy, USSR). 1963. THE UNSUITABILITY OF THE "DRY" METHOD OF FERTILIZATION OF EGGS OF MARINE FISHES. (NETSELESOOBRA-

ZNOST' "SUKHOGO" OPLODOTVORENIYA IKRY MORSKIKH RYB). Vopr Ikhtiol 3(3): 563; Biological Abstracts, Vol. 45, No. 21, Abst. No. 89712. 1964.

The "dry" method of artificial insemination consists of mixing together eggs and sperm in a small amount of water. This method is used with fresh water and diadramous fish, the sperm of which do not usually survive for more than a few minutes in water. The sperm of marine fishes, however, are considerably more viable (1-2 days); consequently, for marine fishes the "wet" method of insemination is more suitable. In this method less sperm are used, no physical mixing is required, spoilage from bacterial decay of dead sperm attached to the outside of eggs is unlikely and fertilization can take place over a relatively long period of time (for those eggs which require such additional time).

--L. T. Penny.

8009. Manzer, J. I. (Fisheries Research Board of Canada, Biological Station, Nanaimo, British Columbia, Canada), T. Ishida, A. E. Peterson, and M. G. Hanavan. 1965. SALMON OF THE NORTH PACIFIC OCEAN — PART V. OFFSHORE DISTRIBUTION OF SALMON. International North Pacific Fisheries Commission, Bulletin Number 15, Vancouver, British Columbia, Canada. 452 p.

A description of the offshore distribution of salmon as determined from information obtained from research vessel operations and records of commercial fishing vessels. Written jointly by authors representing the three national sections of the Commission. (From preface).

8010. Ingle, Robert M., Robert F. Hutton, and Robert W. Topp. (Fla. Bd. Conserv., Tallahassee, Fla.). 1962. RESULTS OF THE TAGGING OF SALT WATER FISHES IN FLORIDA. Florida State Bd Conserv Tech Ser 38. 1-57. Illus.; Biological Abstracts, Vol. 45, No. 21, Abst. No. 89719. 1964.

A fishing contest, generously subsidized by private funds for tagging expenses, advertising, rewards, prizes and other incidental costs, provided the opportunity for making state-wide tagging and recovery studies. Useful information was obtained on growth and migration (or lack of them), efficacy of different tags on several species previously untagged, comparative fishing pressures in different areas, and costs of conducting such a large-scale study. (Authors).

8011. Ivanova, M. N. 1963. OBSERVATIONS ON THE FEEDING OF PREDACEOUS FISHES DURING THE FIRST 4 YEARS OF THE EXISTENCE OF THE GOR'KOVOE RESERVOIR. (O PITANII KHISHCHNYKH RYB V PERVYE CHETYRE GODA SUSHCHESTVOVANIYA GOR'KOVSKOGO VODOKHRANILISHCHA). Tr Inst Biol Vodokhran Akad Nauk SSSR 5. 81-86; Referat. Zhur., Biol., 1963, No. 20I46. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 89721. 1964.

A study was made in 1956-59 of the food of pike (Esox lucius), burbot (Lota lota), and zander (Stizostedion lucioperca), using 923 specimens. Immature pike in the middle part of the reservoir fed on fish (roach, perch), frogs, and invertebrates. In the lower part, where adult pike aggregated, the food consisted exclusively of fish. Very small amounts of bream (Abramis brama) and zander were consumed by pike only during the first 2 years of the reservoir's existence. Young burbot ate weed crustaceans and chironomid larvae; adult burbot ate chironomid larvae and fish. Adult zander feeds exclusively on fish. Owing to the differences in food composition, feeding rhythm, feeding grounds, and feeding season, there is no competition for food between pike, zander and burbot. Since, moreover, these fishes utilize waste fish, they improve the biological conditions of the reservoir.

8012. Luzhin, B. P. 1963. OBSERVATIONS ON THE ACCLIMATIZATION OF THE AMU-DAR'YA TROUT IN THE SYR-DAR'YA BASIN. (OB AKKLIMATIZATSII AMU-DAR'INSKOI FORELI V BASSEINE SYR-DAR'I). Izvest Akad Nauk Kirghizsk SSR Ser Biol Nauk 5(2): 43-45.; Referat. Zhur., Biol., 1963, No. 21I70. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 89733. 1964.

The Amu-Dar'ya trout (Salmo trutta oxianus), acclimatized in the Syr-Dar'ya (Kara-Ungur and Dzhaily-Su Rivers), is distinguished by a high rate of growth. Fish were found in its diet (Severtsov's osman, Tibetan stone-loach). A positive correlation between trout growth rate and river size was noted.

8013. Persov, G. M. 1963. "POTENTIAL" AND "ACTUAL" FECUNDITIES IN FISH, AS EXEMPLIFIED IN THE PINK SALMON ONCHORHYNCHUS GORBUSCHA (WALB.) ACCLIMATIZED IN THE BASINS OF THE WHITE AND BARENTS SEAS. ("POTENTSIAL'NAYA" I "KONECHNAYA" PLODOVITOST' RYB NA PRIMERE GORBUSHI ONCORHYNCHUS GORBUSCHA (WALB.), AKKLIMATIZIRUEMOI V BASSEINAKH BELOGO I BARENTSEVA MOREI). Vopr Ikhtiol 3(3): 490-496. Illus.; Biological Abstracts, Vol. 45, No. 21, Abst. No. 89753. 1964.

Salmon eggs, two-thirds hatched, were transported from South Sakhalin to the hatcheries of Zapolyar'e (Barents and White Sea Basin). Following hatching and larval development, the young salmon descended the streams to the sea. They returned to breed in 1960 and in 1961. A comparison between breeders of the same size from the two areas shows that the females of Zapolyar'e had higher absolute fecundities (AF), but had smaller body, ovarian and egg weights, than those of South Sakhalin (1957-1960). When the number of germ cells (in various stages) were counted in ovaries taken from fish in different stages (embryos through adults), it was found that: (1) maximum growth in germ cell numbers occurred from the first appearance of germ cells (18-20 days after fertilization, 9-10° C.) to hatching (at Zapolyar'e); (2) a slightly less rapid growth in numbers occurred from hatching to May (at Zapolyar'e); (3) a rapid decrease in sex cell numbers (degeneration) occurred from May through the June-Sept. descent to the sea; (4) a gradula decrease in numbers occurred from Aug. to breeding time in the following year. The maximum number of germ cells ("potential"

fecundity) was 5152 in the Zapolyar'e population and 2867 in the South Sakhalin population (in April), while the minimum numbers ("actual" fecundity) were 1850 and 1600 respectively. The increased actual fecundity, but decreased body, ovarian and egg weights, associated with the Zapolyar'e populations, is seen as a species-specific auto-regulatory adaptive mechanism, providing for the intense inhabitation of a new region in a minimum length of time. --L. T. Penny.

8014. Sokolov, O. A. 1962. UNDERWATER OBSERVATIONS ON THE REACTION OF HERRING TO ARTIFICIAL LIGHT. (A CRITICAL NOTE ON M. I. RYZHENKO'S PAPER). (PODVODNYE NABLYUDENIYA ZA REAKTSIEI SEL'DI NA ISKUSSTVENNYI SVET. (KRITICHESKIE ZAMECHANIYA K STAT'E M. I. RYZHENKO)). Tr Okeanog Komis Akad Nauk SSSR 14: 103-104; Referat. Zhur., Biol., 1963, No. 19I71. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 89770. 1964.

Herring occurring in large concentrations near a moving submarine are thrown into a state of shock when suddenly illuminated by lights. On scattering, they can cause a disturbance in parts of the school swimming near the submarine. As a result, blinded herring are "squeezed" into the spece between the school and the submarine where they can be noticed by observers. Subsequently the schools scatter and move away from the light. Emphasizing the fact that herring exhibit a negative reaction to artificial light, and the fact that this light is different from that this light is different from that emitted by various forms of luminescent plankton, the author critizes M. I. Ryzhensko's explanation of the herring's response to moving sources of light, and agrees with his conclusions concerning the possibility of using this response in commercial capture.

8015. Karzinkin, G. S., and M. N. Krivobok. 1962. A METHOD OF SETTING UP BALANCE EXPERIMENTS FOR STUDY OF NITROGEN METABOLISM IN FISH. (METODIKA POSTANOVKI BALANSOVYKH OPYTOV PO IZUCHENIYU OBMENA AZOTA U RYB). In: Rukovodstvo po metodike issledovaniya fiziologii ryb. (Instructions on the method of research in fish physiology). Akad. Nauk SSSR: Moscow. 108-126; Referat. Zhur., Biol., 1963, No. 4I35. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 90173. 1964.

In contrast to balance experiments on warm-blooded animals, tests with fish are usually set up on mass material, and the unknown value is the amount of N consumed/unit of time. The tests last for 5-15 days. The periods of observation fluctuate, depending on age, growth rate of the fish, physiological condition, season and other factors. For purposes of the experiment, single-sized fish taken from the natural waters were placed incontainers with water from the same natural waters. The volume of the water depended on the fish species, their size, the temperature of the water and its O_2 saturation. The experiment continued for 3 hours. In order to detect daily fluctuations, the experiment was repeated 3 times more in the course of 24 hours. During the experiment, the excrement was carefully removed from the aquarium. After the experiment, the fish were weighed, either as a whole or ground up, dried at 70° or fixed in 3-5 ml of H_2SO_4. The removed excrement was also dried, and the water from the aquarium was fixed with H_2SO_4. The percentage of N in the body, water, excrement and food of the fish was determined by the Kjeldahl method. Detailed descriptions of the method and pertinent calculations were cited. The total amount of N deposited in the body, excreted with products of protein metabolism and with excrement, constituted the N balance. A positive balance was characteristic for fish in the growth period; a negative balance occurred in the winter when the fish stop feeding. The daily ration was calculated by the formula:

$$X = \frac{A \times 100}{B}$$

where A is the daily amount of N consumption in mg, and B is the amount of N in raw food. The N content was tabulated in some basic fresh-water organisms.

8016. Barannikova, I. A. 1963. A STUDY OF THE ROLE OF NEUROENDOCRINE REGULATION IN THE ACCLIMATIZATION PROCESS OF ANADROMOUS FISHES. (IZUCHENIE ROLI NEIROENDOKRINNOI REGULYATSII V PROTSESSE AKKLIMATIZATSII ANADROMNYKH RYB). In: Akklimatizatsiya zhivotnykh v SSR. (Acclimatization of animals in the USSR).; Akad. Nauk Kaz. SSR: Alma-Ata. 5-6.; From: Ref Zh Biol., 1964, No. 2I103. (Translation); Biological Abstracts, Vol. 45, No. 21, Abst. No. 90646. 1964.

In evaluating the results of acclimatization of anadromous fishes, particularly pink salmon, it is essential to take into account the condition of the neuroendocrine system which controls the upstream and downstream migrations of fishes. A brief description is presented of changes occurring in the pituitary and thyroid glands of the pink salmon during its entry into rivers of the Arctic Circle. The role of the glands in the regulation of metabolic processes during that period was also studied.

8017. Bertler, Ake, Bengt Falck, and Claes von Mecklenburg. (Dept. Pharmacol., Univ. Lund, Lund, Sweden). 1963. MONOAMINERGIC MECHANISMS IN SPECIAL EPENDYMAL AREAS IN THE RAINBOW TROUT, SALMO IRRIDEUS L. In: 2nd Conference of European Comparative Endocrinologists, Brussels.; Gen Comp Endocrinol 3(6): 685-686. 1963. --Abstract only.; Biological Abstracts, Vol. 45, No. 21, Abst. No. 90961. 1964.

8018. McAllister, D. E. 1963. FISHES OF THE 1960 "SALVELINUS" PROGRAM FROM WESTERN ARCTIC CANADA. Natl Mus Canada Bull 185. 17-39. Illus. Maps. (French summ.); Biological Abstracts, Vol. 45, No. 21, Abst. No. 93660. 1964.

Thirty spp. fish from the Herschel Island area, Yukon Territory, and 14 from Aklavik, N. W. T., Canada, are reported on in this paper. Descriptive and taxonomic comments are made on each sp.

Artediellus scaber, Lycodes jugoricus, and L. rossi are reported from Arctic Canada for the first time. Aspidophoroides olrikii is recorded for the first time from the Beaufort Sea. Additional diagnostic characters for Coregonus sardinella and C. autumnalis are given. Doubt is cast on recognition of sp. Stenodus leucichthys. The Canadian sp. of Eleginus is indicated to be gracilis rather than navaga. Confirmation is obtained that Liparis herschelinus is distinct from L. tunicatus. Evidence is found in favor of regarding Liopsetta glacialis as a sp. distinct from L. putnami. Other genera commented on are Entosphenus, Clupea, Salvelinus, Osmerus, Mallotus, Esox, Catostomus, Couesius, Platygobio, Lota, Boreogadus, Pungitius, Percopsis, Ammodytes, Lumpenus, Cottus, Gymnocanthus, Icelus, Myoxocephalus, and Triglops. Herschel Island fish are considered to belong to the Innuit fauna, a low Arctic fauna which stretches along the coast from Boothia Peninsula, Canada, to Barents Sea, Europe. (Auth.)

8019. Clark, Eugenie. (Cape Haze Mar. Lab., Sarasota, Fla.). 1963. THE MAINTENANCE OF SHARKS IN CAPTIVITY. II. EXPERIMENTAL WORK ON SHARK BEHAVIOR. In: 1st Congres International d'Aquariologie. (1st International Congress of Aquariology)., Monaco 1960. Vol. D. Bull Inst Oceanog Monaco 1D. 1-11. Illus. (French and German summ.); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94154. 1964.

A recent survey of sharks in captivity shows that at least 50 species have been successfully maintained for experimental or show purposes in over 58 aquariums and laboratories throughout the world. Small and sluggish sharks are maintained with best results (some have lived for 25 years) although a few streamlined carcharhinids have survived a year or more and a whale shark several months after capture. Our studies have been mainly on the lemon shark, Negaprion brevirostris. Individuals between 2 and 3 meters long have been conditioned to press a target for remotely placed food and then tested for their ability to make visual discriminations between targets of various shapes and colors. Conditioned responses were retained after a 10 week period of inactivity. Also in progress are experiments testing the functions of abdominal pores in sharks. (Auth.)

8020. Aristovskaya, G. V. 1963. FEATURES OF BOTTOM FAUNA FORMATION IN THE KUIBYSHEV RESERVOIR. (OSOBENNOSTI FORMIROVANIYA DONNOI FAUNY KUIBYSHEVSKOGO VODOKHRANILISHCHA). Nauchn-Tekh Byul Gos Nauchn-Issled Inst Ozernogo Rechnogo Rybn Khoz 16. 24-28; Referat. Zhur., Biol., 1963, No. 11D292. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94267. 1964.

In Kuibyshev Reservoir the benthos biomass was highest in the first year (1957) and then decreased. In the former bed of the Volga, however, the average benthos biomass increased up to 1959, and then decreased. On flooded land comprising 84% of the water area of the reservoir, the biomass of benthos was at a minimum in 1959 there after increased slightly. In the period 1958-1961 the biomass of benthos in the whole reservoir was, on the average, approximately 5 g/m^2. A reduction in the biomass of benthos could be attributed to Abramis since the number has greatly increased.

8021. Abram, F. S. H. (Min. Agric., Fish. and Food., London, England). 1964. AN APPLICATION OF HARMONICS TO FISH TOXICOLOGY. Air Water Pollution 8(5): 325-338. Illus.; Biological Abstracts, Vol. 45, No. 22, Abst. No. 94304. 1964.

When fish are poisoned in batches under constant conditions it is found that their individual times of survival are distributed harmonically. There is a linear relationship between the rates of mortality (reciprocal times of survival) and cumulative percentage mortality. The harmonic mean survival time affords a fair estimate of the time taken to kill 50 percent of a batch of fish, and is close to the median survival time. For many toxins the rate of mortality is found to be a linear function of the logarithm of the concentration of the poison; whereas the comparable relation between the logarithms of the survival time and the concentration is non-linear. The linear function can be exploited to provide comparatively simple methods of estimating long-term survival concentrations. An application of this is suggested for defining realistic standards of toxicity. (Auth.)

8022. Andres, A. G., and T. N. Kurazhskovskaya. 1963. PATHOLOGICAL CHANGES IN BREAM CAUSED BY OXYGEN DEFICIENCY. (PATOGISTOLOGICHESKIE IZMENENIYA U LESHCHA PRI DEFITSITE KISLORODA). Tr Inst Biol Vodokhran Akad Nauk SSSR 5. 8. 87-109; Referat. Zhur., Biol., 1964, No. 11I6. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94307. 1964.

A histological study was made of tissues of fishes kept in running, deoxygenated water. Some fishes survived for 28 hours. The process was found to consist of 3 periods: initial, active compensation, and final. In the first period, after 20 minutes of O_2 deficiency, there developed a hemodynamic disturbance: overfilling of myocardium capillaries with blood and swelling of gill filaments, thus increasing the respiratory surface. A half-hour's "rest" during this period enabled the fish to return to a normal condition. After 1-1/2 to 3 hours of deoxygenation the changes reach a maximum, complicated by edema and stases in various tissues. In the active compensation period, blood formation rises sharply in already existing as well as in newly formed hematotic centers (particularly in kidneys), the process being preceded by intensive production of white blood cells. In later stages of asphyxia hematosis diminishes. In the 2nd period the gill filaments show an accumulation of large cells containing large nuclei and playing, apparently, an active role in respiration. In the last stage myocardial lesion increases; there is focal destruction of the heart muscle; blood circulation is severely impaired, and spleen blood cells show marked disintegration. Fish mortality is caused, apparently, by circulatory disturbance in the central nervous

system, with hemorrhages in region IV of the ventricle. Histological changes in various organs are discussed in detail.

8023. Cairns, John Jr., and Arthur Scheier. (Acad. Nat. Sci., Philadelphia, Pa.). 1964. THE EFFECTS OF SUBLETHAL LEVELS OF ZINC AND OF HIGH TEMPERATURE UPON THE TOXICITY OF A DETERGENT TO THE SUNFISH LEPOMIS GIBBOSUS (LINN.). Notulae Nat (Philadelphia) 367. 1-3; Biological Abstracts, Vol. 45, No. 22, Abst. No. 94311. 1964.

Specimens were exposed to alkyl benzene sulfonate detergent for 30 days at a concentration sufficient to cause marked gill damage, and then to both zinc chloride and increased temperature in separate tests. The exposure to alkyl benzene sulfonate did not cause a gross change in tolerance to either zinc ion or increased temperature. (Auth. Abst.)

8024. Herbert, D. W. M., and D. S. Shurben. (Water Pollution Res. Lab., Stevenage, Herts., England). 1964. THE TOXICITY TO FISH OF MIXTURES OF POISONS. I. SALTS OF AMMONIA AND ZINC. Ann Appl Biol 53(1): 33-41. Illus.; Biological Abstracts, Vol. 45, No. 22, Abst. No. 94328. 1964.

Experiments were made with rainbow trout in solutions of ammonium chloride and zinc sulfate to examine the empirical rule that a mixture of two poisons, P and Q, should be at the threshold concentration for acute toxicity when $P_S/P_T + Q_S/Q_T = I$, where the suffix S stands for the concentration in solution and T for the threshold concentration of a poison when tested by itself. The most detained experiment, with a hard dilution water in which the dissolved-O_2 concentration was at the air-saturation value, gave results within 4% of those expected from the hypothesis. Agreement was not so close in a soft dilution water, nor in a hard dilution water containing a reduced concentration of dissolved O_2, but in these two cases the threshold concentrations for the mixtures were within 26 and 17% of the expected value of unity. In every case the rule under examination provided a better description of the data than models based on the hypothesis of independent joint action. (Authors)

8025. Horton, Howard Franklin. 1964. THE FACTORS LEADING TO POSTLIBERATION MORTALITIES OF TROUT (SALMO GAIRDNERI) TRANSPORTED IN TANK TRUCKS. Dissert Absts 24(8): 3042-3043. Abstract only; Biological Abstracts, Vol. 45, No. 22, Abst. No. 94329. 1964.

8026. Lapitskii, I. I. 1958. FORMATION OF POPULATIONS AND CONDITION OF THE STOCKS OF THE MAIN COMMERCIAL FISHES OF TSIMLYAN RESERVOIR. (FORMIROVANIE STAD I SOSTOYANIE ZAPASOV OSNOVNYKH PROMYSLOVYKH RYB TSIMLYANSKOGO VODOKHRANILISHCHA). Izvest. Vses. Nauchn.-Issled. Inst. Ozernogo Rechnogo Rybn. Khoz. 45: 90-110; Referat. Zhur., Biol., 1960, No. 25665. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94333. 1964.

Fish populations of the reservoir were formed mostly from river species and less from anadromous and semianadromous species carried in from the lower reaches of the Don River or transferred by fish-lift. In the first year of the reservoir spawning conditions were favorable for most species of fish. In late years (1953-1956) spawning areas shrank due to fluctuations in water level. This disturbed the reproduction of phytophylic species and decreased the recruitment of many species. The main commercial species are: Abramis brama, A. ballerus and Esox lucius. Their stocks are not stable. The slow development of populations of Cyprinus carpio and Stizostedion lucioperca is due to unfavorable conditions (asphyxiation, epidemic infectious dropsy, mortality of the fry of Stizostedion lucioperca) and disturbed spawning conditions. --Courtesy NSF (PL 83-480) 1963.

8027. Luzhin, B. P. 1963. RESULTS OF ACCLIMATIZATION OF THE SEVAN TROUT (SALMO ISHCHCHAN) IN LAKE ISSUK-KUL' AND PROSPECTS OF INCREASING THE ABUNDANCE OF ITS STOCK. (REZUL'TATY AKKLIMATIZATSII FORELI GEGARKUNI V OZERE ISSYK-KUL' I PERSPEKTIVY UVELICHENIYA CHISLENNOSTI EE STADA). In: Akklimatizatsia zhivotnykh v SSSR. (Acclimatization of animals in the USSR). Akad. Nauk Kazakhsk. SSR: Alma-Ata. 259-261.; Referat. Zhur., Biol., 1963, No. 24I62. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94335. 1964.

Sevan trout acclimatized in Lake Issyk-Kul' grow very well and their fecundity is greater than that of the parental form. Its low abundance is explained by the shortage of spawning grounds and by the mortality of spawn and fry. Its abundance can be increased through fish-farm methods of trout cultivation, by the liberation of young during their transition to mixed feeding and during the downstream-migration stage.

8028. Filonov, K. P., and G. S. Kaplin. 1962. ON THE QUESTION OF THE SPAWNING OF GRAYLING IN THE WILD-LIFE RESERVE. (K VOPROSU O NERESTE KHARIUZA V ZAPOVEDNIKE). Tr Barguzinsk Gos Zapovednika 4. 230-232.; Referat. Zhur., Biol., 1964, No. 1I56. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94343. 1964.

Observations on the spawning of grayling were carried out in the Bargusin wild-life Reserve on the Davsha River in 1961. The run into the river began on the 5th of May; spawning took place from May 15 to 23 at a distance of 12-15 kilometers from the river's mouth. Places where the fish cast their spawn are described. After spawning most grayling returned to the Baikal, while the remainder stayed in the spawning area till summer.

8029. Oglesby, Ray Thurmond. 1964. EXAMINATION OF CERTAIN BIOCHEMICAL RESPONSES OF FISH TO IN VIVO CHLORINATED HYDROCARBON INSECTICIDE EXPOSURE IN WATER. Dissert Absts 24(8): 3299. Biological Abstracts, Vol. 45, No. 22, Abst. No. 94349. 1964.

8030. Smirnova, A. I. 1963. VIABILITY OF PINK SALMON (ONCORHYNCHUS GORBUSCHA) EGGS AND SPERM IN WATER. (SOKHRANENIE V VODE SPOSOBNOSTI YAITS I SPERMATOZOIDOV GORBUSHI (ONCORHYNCHUS GORBUSCHA WALBAUM) K OPLODOTVORENIYU). Nauchn Dokl Vysshei Shkoly Biol Nauk 3. 37-41; Referat. Zhur., Biol., 1963, No. 23I62. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94362. 1964.

At the Sokolov fish-farm in Sakhalin the viability of O. gorbuscha sperm and eggs was ascertained by the percentage of dividing egg cells after they had been kept in water for some time. It was established that 10 seconds after dilution with water the sperm fertilized 70 to 75% of the eggs, and 0 to 1% after 50 to 70 seconds. Sperm of O. gorbuscha and of other salmon species exhibited greater viability after 150 seconds, a fact which was attributed to the temporary rise in motility of part of the spermatozoa prior to their death. As much as 50 to 70% of O. gorbuscha eggs remained fertilizable for 1 minute after being placed in water, and thereafter their fertilizability decreased gradually over a period of 15 minutes.

8031. Verigin, B. V., Nguen V'et, and Nguen Dong. 1963. DATA ON FOOD SELECTIVITY AND DAILY RATIONS OF THE GRASS CARP, CTENOPHARYNGODON IDELLA. (MATERIALY PO IZBIRATEL'NOSTI Y PISHCHE I SUTOCHNYM RATSIONAM BELOGO AMURA). In: Materialy Vsesoyuznogo soveshchaniya po rybokhozyaistvennomu osveoniyu rastitel'noyadnykh ryb-belogo amura i tolstolobika v vodoemakh SSSR, 1961. (Materials of the All-Union conference on the cultivation of the herbivores, grass carp and silver carp, in waters of the USSR, (1961)). Akad. Nauk Turkmensk. SSR: Ashkhabad. 192-194; Referat. Zhur., Biol., 1964, No. 1I53. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94367. 1964.

Experiments were conducted in cooling ponds of the state regional electric power plant (GRES) at 30°C. The studies have shown the position (1st, 2nd or last) occupied by a given plant in the nutrition of grass carp. Among the plants occupying 1st place were pond weed, hornwort, Elodea, duckweed, frogbit, marsh grass, reed mace, common reed grass, clover, couch grass, celandine, yarrow and goosefoot. On feeding grass carp with various plant species, rough data were obtained concerning its daily food ration. The food coefficient was 30.

8032. Stroganov, N. S. 1962. PROCEDURE FOR THE DETERMINATION OF AMMONIA IN A STUDY OF FISH METABOLISM. (METODIKA OPREDELENIYA AMMIAKA PRI IZUCHENII OBMENA VESHCHESTV U RYB). In: Rukovodstvo po metodike issledovanie fiziologi ryb. (Handbook of procedures for the study of fish physiology). Akad Nauk SSSR: Moscow. 127-133.; Referat. Zhur., Biol., 1963, No. 8I79. (Translation); Biological Abstracts, Vol. 45, No. 22, Abst. No. 94770. 1964.

A colorimetric method with Nessler's reagent is described. For serial colorimetric determinations, a mineral artificial scale was used, selected by color from a combination of K_2PtCl_6 and $CoCl_2$ solutions. The scale was checked with a standard solution of NH_4Cl. First ammonia was distilled from the samples. Then 50 cm^3 of distillate was poured into a pycnometer and 1 cm^3 of Nessler's reagent was added which had been previously prepared. The resulting solution of $NH_2Hg_2I_3$ had a yellowish color. The N content in the sample was determined by comparison of the color of the solution with the scale. The procedure makes it possible to determine ammonia with an accuracy of 0.01 mg N per liter. The amount of ammonia nitrogen secreted by the fish was calculated according to the formula:

$$\frac{m_1 - m_o v}{pt} = \text{N mg per g weight of the fish}$$

per hour, where m_o and m_1 are the ammonia concentrations in mg/liter N before and after the experiment; v is the volume of water in which the fish is located; p is the weight of the fish in g, t is the time of the experiment.

8033. De Kock, L. L. (Dept. Nat. Hist., Univ. Aberdeen, Aberdeen, Scotland). 1963. A HISTOLOGICAL STUDY OF THE HEAD REGION OF TWO SALMONIDS WITH SPECIAL REFERENCE TO PRESSOR- AND CHEMO-RECEPTORS. Acta Anat (Basel) 55(1/2): 39-50. Illus.; Biological Abstracts, Vol. 45, No. 22, Abst. No. 96145. 1964.

Detailed histological data are reported of heart, ventral aorta and afferent branchial arteries, gills, efferent vessels and dorsal aorta in two species of salmonid fishes (Salmo trutta L. and S. salar L.). The object of the study was to explore these regions for evidence of chemoreceptive tissue. A variety of histological techniques was used including Holmes' silver method for determining innervated areas. Typical chemoreceptive tissue such as occurs in the carotid body of higher vertebrates was not detected in these fish within the regions examined. The only potential chemo-sensory receptors present were large numbers of "end-buds" (Thomas, 1941) within the pharygeal cavity, whose situation exposes them freely to the respiratory current. Their precise function, however, is, so far, undetermined. Existing experimental evidence for the presence of chemoreceptors in relation to the nerve supply of the buccal region is discussed. (Auth.)

8034. Buxton, A. G. (Panocean Co., Colombo, Ceylon). 1962. THE TRANSPORTATION OF FISH FROM NEAR AND FAR. In: First Congres International d'Aquariologie, Monaco 1960. Vol. A. (1st International Congress of Aquariology, Monaco, 1960). Bull Inst Oceanog Monaco Spec. No. 1A, 153-163. Illus. (French and German Summ.); Biological Abstracts, Vol. 45, No. 23, Abst. No. 98190. 1964.

This article deals with the main reasons for the mortality of fish between the time the fish are caught and their arrival at their final destination. The first point stressed is the superiority of air transport over any other. Fish can be crowded in large numbers for a short period of about up to 30 hours. Airlines give special commodity rates for fish transportation. The reasons for mortality start

with the actual catching of the fish. With marine species, only fish caught by expert skin divers are free from scratches and wounds etc. Mortality is due 80% of the time to fish getting cold in the airplanes and at the airports. The shippers and aquariums are entirely at the mercy of the airlines, even heavy insulation at times does not help. Overcrowding can be simply rectified by sending less fish per container but this increases the freight charges. One must find a suitable number and this requires a great deal of packing experience. Delay is beyond the control of the shipper and accounts for about 4% of the actual losses. Disease can be avoided by experience in recognizing even slightly sick fish and treating of the water in which the fish travel to avoid contracting any of the diseases or the cure en route of unnoticeable disease. Fighting of fish happens more frequently when there is oxygen in the bags. This can be controlled by placing sleeping drugs in the water or by putting mixed species into each container having no two of the same aggresive type in the same bag. Finally some species have sharp teeth and damage the plastic bags en route and thus kill themselves. This can be avoided by putting them in perforated hard plastic boxes inside the actual bags. Sending fish year in and out with 5 to 10% losses can be considered as good results but these results can only be obtained by considerable care in the packing of fish assuming that fish are completely undamaged when caught. (Auth.)

8035. Herald, Earl S., Robert P. Dempster, Clyde Wolters, and Marjorie L. Hunt. (Steinhart Aquarium, Calif. Acad. Sci., San Francisco, Calif.). 1962. FILTRATION AND ULTRAVIOLET STERILIZATION OF SEA WATER IN LARGE CLOSED, AND SEMI-CLOSED AQUARIUM SYSTEMS. In: First Congres International d'Aquariologie, Monaco 1960. Vol. B. (1st International Congress of Aquariology, Monaco, 1960.) Bull Inst Oceanog Monaco 1B. 49-61. Illus. (French and German summ.); Biological Abstracts, Vol. 45, No. 23, Abst. No. 98197. 1964.

A test program conducted with specially-designed equipment over a period of 18 months, revealed that in operating the standard sand-and-gravel filter, the actual filtration is carried out in the top 1-1/2 inches of the filter sand, regardless of the depth of the sand. Inoculation of the filter bed with biological media in the form of enchytraeid worms, such as Pachydrilus pagenstecheri, is suggested as a method of increasing the effectiveness of filtration. The sedimentation tank and its role in aquarium filtration is discussed with calculations of the relationship of the weight of fishes to the volume of water in sea water aquarium systems. Steinhart Aquarium water was found to be extremely high in gram negative hemolytic bacteria (1500 to 2000 per cc) and in order to remove these, a test program of ultraviolet sterilization was instituted; this removed more than 98% of the bacteria. (Authors)

8036. Gans, Carl, and Thomas S. Parsons. 1964. A PHOTOGRAPHIC ATLAS OF SHARK ANATOMY. Academic Press, Inc., New York 3, N. Y., 106 p. Illus.; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98239. 1964.

Forty plates illustrate all features of external and internal anatomy of Squalus acanthias. Dissections show different views, including all systems. Parts are numbered, with key to labels, diagram indicating angle and section of photograph, and brief comments given on opposite page. An index and synonymy of anatomical terms is provided. Ring binding permits atlas to lie flat at any page. --R. W. Dexter.

8037. Simkatis, Helen. 1964. SALT-WATER FISHES FOR THE HOME AQUARIUM. J. B. Lippincott Company, Philadelphia 5, Pa. 254 p. Illus., Pr. $6.; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98257. 1964.

Part I of this practical guide provides background information and advises the would-be marine aquarist on how to choose and set up his aquarium, how to select compatible fish and invertebrate companions and how to maintain both the environment and the fishes in a healthy condition. Details of equipment and methods for collecting his own specimens are also included. Part II presents data on salt-water aquarium fish: general considerations; marine fishes from Atlantic waters; the exotics; and estuary fishes. A final chapter is a summary of essential information. Suggested readings are included as well as a glossary of terms and an index. Photographs and line drawings illustrate the text. --P. V. Parkins.

8038. FAO Fisheries Division, Biology Branch. (Food and Agric. Organ. U. Nations, New York, N. Y.) 1963. WORLD LIST OF PERIODICALS FOR AQUATIC SCIENCES AND FISHERIES. FAO Fish Biol Tech Paper Suppl. (19): 1-50.; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98323. 1964.

8039. Allan, I. R. H. (Min. Agr., Fish. and Food, Salmon and Freshwater Fish. Lab., London, England). 1964. THE SALMON AND SEA-TROUT STOCKS OF THE RIVER AXE, DEVON. In: Symposium on freshwater fisheries research, Cambridge, 1964. Ann Appl Biol 53(3): 497-498; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98934. 1964.

A brief description is given of salmon and sea-trout population studies being carried out on a Devon river.

8040. Bainbridge, Richard. (Zool. Lab., Univ. Cambridge, Cambridge, England). 1964. THE PROBLEM OF EXCLUDING FISH FROM WATER INTAKES. In: Symposium on freshwater fisheries research, Cambridge, 1964. Ann Appl Biol 53(3): 505-508; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98935. 1964.

An account is given of methods now used in excluding fish from the water intakes of power stations, hydroelectric schemes etc. A brief analysis of the relevant fish senses and behavioral characteristics involved in these is presented and there are some suggestions for future basic and applied research. (Auth.)

8041. Herbert, D. W. M., and Jennifer M. Vandyke. (Water Pollut. Res. Lab., Stevenage, Herts., England). 1964. THE TOXICITY TO FISH OF MIXTURES OF POISONS. II. COPPER - AMMONIA AND ZINC - PHENOL MIXTURES. Ann Appl Biol 53(3): 415-421. Illus.; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98940. 1964.

Tests with rainbow trout in mixtures of ammonium chloride with copper sulphate and of phenol with zinc sulphate have shown that the threshold of toxic concentration for a 50% mortality occurs in solutions for which a value of 1 is obtained by summing the concentrations of the individual poisons expressed as fractions of their individual threshold concentrations. With ammonia-copper mixtures this method of predicting the threshold concentration becomes progressively less adequate as lower percentage mortalities are considered. (Authors)

8042. Le Cren, E. D. (Freshwater Biol. Ass., Wareham, Dorset, England). 1964. POPULATION DYNAMICS AND EXPLOITATION IN SOME FRESHWATER FISH. In: Symposium on freshwater fisheries research, Cambridge, 1964. Ann Appl Biol 53(3): 495-497; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98947. 1964.

Exploitation of fish is accompanied by compensatory changes in growth and mortality, which therefore require study for the proper management of fisheries. Inversely density-dependent growth in Perca fluviatilis and density dependent mortality in young salmonids are discussed as examples of this principle.

8043. Lloyd, R. (Water Pollut. Res. Lab., Stevenage, Herts., England). 1964. SEWAGE EFFLUENTS AND THEIR EFFECTS ON FISHERIES. In: Symposium on freshwater fisheries research, Cambridge, 1964. Ann Appl Biol 53(3): 508-509; Biological Abstracts, Vol. 45, No. 23, Abst. No. 98948. 1964.

Some recent laboratory and field studies, made in Great Britain, are reviewed, with special reference to the effects of low dissolved oxygen concentrations and dissolved poisons.

8044. Funderburg, John B., and Margaret L. Gilbert. (Fla. S. Coll., Lakeland, Fla.). 1963. OBSERVATIONS ON A PROBABLE NEW RACE OF THE BOWFIN, AMIA CALVA (ECOLOGY, DISTRIBUTION, BREEDING BEHAVIOR), FROM CENTRAL FLORIDA. In: 24th Annual meeting of the Association of Southeastern Biologists, Gainesville, Florida, 1963. ASB Bull 10(2): 28. Abstract only; Biological Abstracts, Vol. 45, No. 23, Abst. No. 102530. 1964.

8045. Randall, John E. (Inst. Mar. Biol., Univ. Puerto Rico, Mayaguez, Puerto Rico). 1963. AN ANALYSIS OF THE FISH POPULATIONS OF ARTIFICIAL AND NATURAL REEFS IN THE VIRGIN ISLANDS. Caribbean Jour Sci 3(1): 31-47; Biological Abstracts, Vol. 45, No. 23, Abst. No. 102539. 1964.

In April, 1960 an artificial reef of 800 concrete blocks was built in Lameshur Bay, St. John, Virgin Islands in 9 m of water in seagrass. The blocks were arranged to form tunnels whose total surface area is 50 square m. Observations were made of the kinds and relative abundance of fishes which colonized the reef. The great majority of the fishes came to the reef as juveniles. In August 1962, all of the fishes were collected from the reef with rotenone. A total of 2754 individuals of 55 spp. was taken weighing 87.29 kg. The dominant family was the Pomadasyidae, with 1872 individuals of 4 spp. of Haemulon, weighing a total of 37.08 kg. The most abundant species was H. plumieri. The 2nd largest family was the Serranidae (16.34 kg.), dominated by 65 individuals of Alphestes afer. Other important families were the Holocentridae (11:07 kg.), Acanthuridae (5.25 kg.), Balistidae (4.88 kg.), Scaridae (4.33 kg.) and Muraenidae (4.10 kg.). Some common inshore reef fishes such as snappers of the genus Lutjanus were conspicuous by their absence. The Labridae, Pomacentridae, Gobiidae and other families of small fishes were not represented by large numbers. Two large quantitative poison stations for fishes were carried out on the natural fringing reef of St. John. One of 600 square m resulted in the taking of 96.5 kg. of fish (1352 individuals of 103 spp.). The other of 297 square m totaled 46.87 kg. (1454 individuals of 93 spp.). The areas selected for the poison stations of the natural reefs on St. John appeared to be among those with the greatest density of shore fishes seen around the island. The numbers and mass of reef fishes vary greatly from area to area within the same region. Many factors combine to control their abundance. One of the most important is the amount of shelter afforded by the reef. Another is the amount of seagrass or sand flat nearby; when extensive, populations of certain fishes such as pomadasyids, which feed on the flats at night and hide in the reef by day, may be large. The broad expanse of seagrass around the artificial reef is the probable reason for the reef having 11 times the concentration of fishes as the sectors of shore reef which were poisoned. Fishes feeding on the flats surrounding a reef are not reef fishes from the trophic standpoint. In the same sense, fishes such as Clepticus, Paranthias, Inermia, Ocyurus, and certain Chromis which feed on the plankton of the water mass passing over a reef are not reef fishes. (Auth.)

8046. Nicol, J. A. C. (Marine Biol. Lab., Plymouth, England). 1965. RETINOMOTOR CHANGES IN FLATFISHES. Jour. Fish. Res. Bd. Canada, 22(2): 513-520.

This histological study is concerned with demonstrating the existence of retinomotor changes in flatfishes. In three species, selected as representatives (sole, Solea solea; plaice, Pleuronectes platessa; and merry sole, Microstomus kitt), it is shown that normal radial displacements of rods, cones, and retinal pigment take place in expected directions in light and darkness, with exceptions which may be important but whose implications have still to be revealed. In the plaice the cones of the dorsal retina are permanently retracted against the basement membrane, and mobile elsewhere. The eyes of flatfishes, therefore, conform

to those of other teleosts in photomechanical responses to illumination.

8047. Carter, Wilfred M. 1965. QUEBEC'S 1964 ANGLING STATISTICS. The Atlantic Salmon Journal, Spring 1965. p. 3-8.

Graphically presented data on the sport catch of Atlantic salmon in four regions of Quebec and the varying fishing pressures during the summer.

8048. Kearns, Roger K., and Forbes C. Boyd. (Fish Culture Development Branch, Dept. of Fisheries of Canada, Pacific Area, Vancouver, B. C.). 1965. THE EFFECT OF A MARINE SEISMIC EXPLORATION ON FISH POPULATIONS IN BRITISH COLUMBIA COASTAL WATERS. The Canadian Fish Culturist, Issue 34, May 1965. pp. 3-26.

The Shell Oil Company of Canada conducted a marine seismic survey off the west coast of British Columbia during the summer months of 1963. Observations throughout the survey revealed that 419 (4.3 percent) of a total of 9,638 shot points exhibited a total surface mortality of 59,277+ fish. Herring and rockfish represented 72.2 and 23.8 percent of the total kill respectively with the remaining four percent consisting of 189+ adult salmon, 467+ juvenile salmon and 1,732 miscellaneous fishes. Large charges (50-300 pounds) of nitrone S.M., typical of refraction shooting, killed more fish more frequently than light charges (5-25 pounds) typical of reflection shooting. An increase in detonation depth increased the area of potential fish kill. In shallow water (less than 34 fathoms) the horizontal lethal range of a seismic explosion is greater than in deep water (greater than 34 fathoms). Surface observations of fish mortality were not a reliable measure of charge lethality since they do not account for subsurface mortality. Under existing operational conditions only the vertical scanner on the fish detection unit was found useful in detecting the presence of fishes. In view of the area covered and number of shot points subjected to high velocity explosives, the resulting fish mortality was considered relatively light. (Authors)

8049. Wetzel, Robert G. (Dept. of Zoology, Indiana Univ., Bloomington). 1965. NECESSITY FOR DECONTAMINATION OF FILTERS IN C^{14} MEASURED RATES OF PHOTOSYNTHESIS IN FRESH WATERS. Ecology, Vol. 46, No. 4, pp. 540-542.

Extracellular deposition of C^{14} can lead to large errors in estimates of photosynthesis in many aquatic situations where C^{14} techniques are employed. Of the available pre-radioassay techniques for the removal of extracellular deposition, exposure to fumes of concentrated HCl for a brief period is superior. Loss of radioactivity upon treatment differs among lakes, seasonally, and between illuminated and dark samples. Exposure of desiccated filters to fumes of concentrated HCl for a 10-min period is suggested as a standard procedure prior to assays of radioactivity. (Auth.)

8050. Likens, Gene E. (Dept. of Biol. Sci., Dartmouth College, Hanover, New Hampshire). 1965. MEASUREMENT OF BACKGROUND RADIATION IN LAKES. Ecology, Vol. 46, No. 4, pp. 544-548.

Measurements of background radiation were made in five lakes—two Wisconsin, two New Hampshire, and one antarctic. These lakes were characterized by a small amount of ionizing radiation in mid-water and increasing quantities near the air and sediment boundaries. Moreover, the radioactivity of the sediments in the Wisconsin and New Hampshire lakes usually increased toward the shore line. Count-rate values for the sediments near the shore line were up to ten times higher than the values recorded near the bottom in deep water. A similar pattern of radioactivity distribution in the sediments was not apparent in Lake Vanda, a perennially ice-covered antarctic lake. Various hypotheses were suggested to explain the origin of the anomalous distribution of ionizing radiation in these lakes and its possible role as an environmental factor. (Auth.)

8051. Gopalakrishnan, V., and R.N. Pal. (Central Inland Fisheries Research Institute, Barrackpore, West Bengal). 1964. ADVANCEMENTS IN THE STUDY OF PARASITES OF MIGRATORY FISHES. Proc. Zool. Soc., Calcutta, 17: 63-66.

Recent investigations have revealed that information on the nature and degree of parasitization of fishes may be utilized as a valuable aid in determining the migratory habits of the host and also in raciation studies. Preliminary studies in this direction have been made on the parasites of the red fish, cod, salmons and herring. Among the migratory fishes of India, hilsa is the most important and a comprehensive program of work to study the parasites of this fish has been initiated at the Central Inland Fisheries Research Institute, Barrackpore. The parasitic fauna of the hilsa in West Bengal and Chilka Lake have been found to be different. Data obtained on the seasonal variations and changes under different salinity conditions, in the parasitization of the fish from a stretch of 150 miles of the Hooghly River between Nabodwip and Kakdwip are also very significant. (Authors)

8052. Hynd, J.S. 1965. SOUTHERN BLUEFIN TUNA POPULATIONS IN SOUTHWEST AUSTRALIA. Aust. J. mar. Freshwat. Res. 16(1): 25-32, 2 refs.; CSIRO Abstracts, 13(6): June 1965.

Length-frequency histograms of southern bluefin tuna caught for tagging and other purposes by F. V. Estelle Star in the course of survey operations showed heterogeneity in that the catches contained size groups, the differences between which could not be regarded as simply those to be expected between the age groups of a single stock. The times at which these groups appeared in distributional behaviour, and this was confirmed by the results of the tagging operations. However, the groups are indistinguishable in their growth rate, so far as this has been shown by the present work, and no evidence is yet available as to the origins or status of these groups.

8053. Reingold, Melvin. 1965. A STEELHEAD SPAWNING STUDY. Idaho Wildlife Review, Vol. XVII, No. 4, pp. 8-10.

Observations on the spawning activities of steelhead trout between March 9 and June 2, 1964, on a section of the upper North Fork of the Clearwater River drainage.

8054. Fish, G. R. (Marine Dept., Rotorua, New Zealand). 1963. LIMNOLOGICAL CONDITIONS AND GROWTH OF TROUT IN THREE LAKES NEAR ROTORUA. Proceedings of the New Zealand Ecological Society No. 10, Fisheries Laboratory Publication No. 58.

Lakes Okaro and Ngapouri have a higher primary production and a lower dissolved oxygen content than Lake Okataina. In addition, the density of the trout population is approximately the same or lower than in Lake Okataina. On the other hand, the rate of growth is higher and the ultimate size of adult trout is considerably larger in Okataina than in Ngapouri or Okaro. The observations are correlated to show that eutrophication, resulting from development of farmland in the catchment, has produced an inferior environment for trout in Lakes Okaro and Ngapouri. (Auth. summ.)

8055. Gotshall, Daniel W., J. Gary Smith (Calif. Dept. Fish and Game, Eureka), and Allen Holbert. 1965. FOOD OF THE BLUE ROCKFISH SEBASTODES MYSTINUS. Calif. Fish and Game, 51(3): 147-162.

The stomachs of 806 blue rockfish, collected during 1962 and 1963, yeilded algae, hydroids, jellyfish, crustaceans, tunicates, fish, and a few other types of organisms. These fish came from Bodega, Monterey, and Morro Bay areas, and ranged from 79 to 450 mm total length; 223 of the stomachs were empty. Food habits were studied by fish size, by depth of occurrence, and by season to determine what changes occurred, if any. (Authors)

8056. Smith, Albert C. (Calif. Dept. Fish and Game, Terminal Island). 1965. INTRASPECIFIC EYE LENS PROTEIN DIFFERENCES IN YELLOWFIN TUNA, THUNNUS ALBACARES. Calif. Fish and Game, 51(3): 163-167.

Soluble eye lens proteins of yellowfin tuna were tested by anti-lens serum, cooling, heating, and electrophoresis. Each method indicated that some lenses contain proteins not found in others. This information, together with a consideration of lens anatomy, suggests that procedures performed on the lens are applicable to the problem of identifying individual breeding populations. (Auth.)

8057. Hopkirk, John D. (Univ. Calif., Berkeley). 1965. RECORDS OF YELLOW AND SPOTTED SNAKE-EELS (GENUS OPHICHTHUS) FROM SAN FRANCISCO BAY, CALIFORNIA. Calif. Fish and Game, 51(3): 183-186.

A northern range extension of approximately 400 miles, description, and illustration of the yellow snake-eel, Ophichthus zophochir (Jordan and Gilbert) is presented from a specimen 647 mm TL collected in April 1964, from San Francisco Bay. Recent records indicate the yellow snake-eel is rather common in southern California waters. The spotted snake-eel, Ophichthus triserialis (Kaup), is recorded from San Francisco Bay on the basis of three specimens collected on three separate occasions. (Auth.)

8058. Weidlein, W. Donald, Almo J. Cordone (Calif. Dept. Fish and Game, Lake Tahoe), and Ted C. Frantz (Nevada Fish and Game Comm., Reno). 1965. TROUT CATCH AND ANGLER USE AT LAKE TAHOE IN 1962. Calif. Fish and Game, 51(3): 187-201.

Estimates of total use and catch were obtained by a joint California and Nevada creel census by boat, and at Cave Rock boat landing. Angler-hours and catches on censused days were expanded to monthly totals. Possible biases were examined and considered unimportant, although an underestimate of use and catch was indicated. Total use was 144,147 angler-hours (47,732 angler-days); this amounted to 1.2 angler-hours per surface acre. The total catch was 20,018 fish, or 0.14 fish per angler-hour. About 60% of the catch was lake trout, with "wild" rainbow and planted trout comprising 21 and 17%, respectively. Estimated yield, excluding planted trout, was 0.34 pounds per acre. (Authors)

8059. Chadwick, Harold K. (Calif. Dept. Fish and Game, Sacramento). 1965. DETERMINATION OF SEXUAL MATURITY IN FEMALE STRIPED BASS (ROCCUS SAXATILIS). Calif. Fish and Game, 51(3): 202-206.

Previously developed criteria were not satisfactory for determining the state of maturity of female bass caught in San Francisco and San Pablo bays, California, during the spring and summer of 1961. Observed females ranged from obviously immature to obviously mature with a complete intergradation of intermediate stages. The state of maturity of some at intermediate stages could not be determined. Some ovaries showed early stages of maturation a year or more before spawning. Most spawned-out fish remained recognizable throughout the spring. (Auth.)

8060. West, Delbert A. (Calif. Dept. Fish and Game, Redding). 1965. FRESHWATER SILVER SALMON, ONCORHYNCHUS KISUTCH (WALBAUM). Calif. Fish and Game, 51(3): 210-212.

Three generations of silver salmon have been reared successfully in freshwater at a California hatchery. Eggs and fry were abnormally large and delicate. Adults grew to weights of about 2 pounds each. A freshwater strain could probably be developed for use in inland waters. (Auth.)

8061. Von Geldern, Charles E., Jr. (Calif. Dept. Fish and Game, Sacramento). 1965. EVIDENCE OF AMERICAN SHAD REPRODUCTION IN A LANDLOCKED ENVIRONMENT. Calif. Fish and Game, 51(3): 212-213.

American shad, Alsoa sapidissima, have

apparently reproduced successfully in landlocked Millerton Lake, Fresno/Madera counties. This species was presumably introduced in 1955-57 with plants of striped bass, Roccus saxatilis, from the Mendota Canal and the Tracy Pumping Plant. No introductions of fish have been made since that time from areas where American shad are present. Eleven of 18 shad captured in 1963 were judged to be the result of lake propagation. (Auth.)

8062. Barrett, Izadore, and Alice A. Williams (Inter-Am. Trop. Tuna Comm., La Jolla, Calif.). 1965. HEMOGLOBIN CONTENT OF THE BLOOD OF FIFTEEN SPECIES OF MARINE FISHES. Calif. Fish and Game, 51(3): 216-218.

Many common analytical techniques for determining hemoglobin levels are not suitable for fish bloods. Based on analyses with a satisfactory pyridine hemochromogen technique, the hemoglobin content of the blood of 15 species of marine fishes (mostly scombroids and billfishes) is listed. (Authors)

8063. Messersmith, J. D. (Calif. Dept. Fish and Game, Terminal Island). 1965. SOUTHERN RANGE EXTENSIONS FOR CHUM AND SILVER SALMON. Calif. Fish and Game, 51(3): 220.

A chum salmon, Oncorhynchus keta (Walbaum), was caught off Del Mar, California, (lat. 32°57'N., Long. 117°25'W.) 350 miles south of the previous southern record. A silver salmon, O. kisutch (Walbaum), caught August 20, 1963, off San Jacinto Point, Chamalu Bay, Baja California (lat. 30°50'N., long. 116°11'W.), is the first confirmed record of the species south of the Coronado Islands (lat. 32° 24'N., long. 117°14'W.). (Auth.)

8064. Strachan, Alec R. (Calif. Dept. Fish and Game, Terminal Island). 1965. NEW SOUTHERN RECORD FOR THE SILVERGRAY ROCKFISH, SEBASTODES BREVISPINIS (BEAN). Calif. Fish and Game, 51(3): 220-221.

On March 15, 1965, a silvergray rockfish was caught 4-1/2 miles north of Santa Barbara Island (lat. 33° 33.5'N., long. 119° 04.0'W.). This capture extends the southern range 220 miles. (Auth.)

8065. Kobayashi, Tetsuo, and Masao Sasaki. 1965. EXPERIMENTS USING AIR BUBBLES AND THE LIGHT TO DEFLECT MIGRATING CHUM SALMON FRY, ONCORHYNCHUS KETA (WALBAUM). Scientific Reports of the Hokkaido Salmon Hatchery No. 19, pp. 33-42.

Recent development of irrigation systems and power and water-works has increased the hazards for chum salmon fry during their seaward migration. Therefore, it has become extremely important to devise some method of saving these fish. Since turbulent water, irregular sound and flashing light have proved to be enough to provide an avoiding response for fish, experiments using bubbles and light to deflect migrating chum salmon fry have been made at Chitose Hatchery. An air-bubble screen provides a considerable deflecting effect at night and also in turbid water. Though the light intercepts the movement of the fry, they show a tendency to swarm under the light when descending. (Authors)

8066. Myrberg, Arthur A., Jr., Ernest Kramer, and Peter Heinecke. (Marine Lab. Inst. Marine Sci., Univ. Miami, Miami, Fla.). 1965. SOUND PRODUCTION BY CICHLID FISHES. Science, Vol. 149, No. 3683, pp. 555-558.

Adults of three cichlid species, Hemichromis bimaculatus Gill, Cichlasoma nigrofasciatum (Gunther), and Pterophyllum sp., produce sounds of apparent biological significance. Both sexes of H. bimaculatus produce sounds, but whether both sexes in the other species produce sounds has not been established. The most intense tone frequencies in H. bimaculatus and C. nigrofasciatum lie generally between 300 and 500 cycles per second. The sound produced by Pterophyllum sp., however, has a broad maximum intensity around 3500 cycles per second and component frequencies over 10,000 cycles per second. Sound production appears to depend on the aggressiveness of the individual. (Authors)

8067. Rozin, Paul (Dept. Phycology, Univ. of Pennsylvania, Philadelphia). 1965. TEMPERATURE INDEPENDENCE OF AN ARBITRARY TEMPORAL DISCRIMINATION IN THE GOLDFISH. Science, Vol. 149, No. 3683, pp. 561-563.

Goldfish were taught to press a lever for food reinforcement and were placed on a 1-minute fixed-interval schedule. They developed the characteristic temporal discrimination (scalloping) seen in rats and pigeons. There was no change in their relative response rate through the 1-minute interval when ambient temperature was decreased by 10° C. This 10° C. temperature drop, which approximately halves the metabolic rate, approximately halved the absolute response rate. These results indicate that a temporal discrimination can be established in the goldfish, and suggest that discriminations of short intervals in fish are not dependent on a mechanism tied directly to metabolic rate. (Auth.)

8068. Cuinat, Robin. 1962. DANGERS OF ELECTRIC FISHING. PRECAUTIONS TO TAKE. (DANGERS DE LA PÈCHE ÉLECTRIQUE. PRÉCAUTIONS À PRENDRE). Bulletin Français de Pisciculture, No. 204, pp. 125-131.

Conditions in which accidents can happen during manual, wading-type electrofishing in streams are described. The possible risks of electric current entering various parts of the human body, of the types of current, and of voltages and resistances are mentioned. The most frequent causes of accidental electric shock near the generating unit, near the conductor wires, and near the positive and negative electrodes are described. Some simple and practical precautions to eliminate electric shocks are listed and illustrated, including advice to avoid use of positive electrodes which also serve as dip nets. --R. E. Lennon.

8069. Osterberg, Charles, Norman Cutshall, and John Cronin. 1965. CHROMIUM-51 AS A RADIOACTIVE TRACER OF COLUMBIA RIVER WATER AT SEA. Science, Vol. 150, No. 3703, p. 1585-1587.

The plume of the Columbia River was followed 350 kilometers to sea by measurement of its

chromium-51 content. This radioactive tag, introduced into the river by neclear reactors at Hanford, Washington, promises to provide a useful oceanographic tool for determining rates of transport and mixing, and for identifying plume waters in the presence of other sources of fresh water. (Authors)

8070. Titus, Harold. 1965. BIG FISHING HOLE. Field & Stream, Vol. 70, No. 7. p. 64-66.

Control of sea lamprey, stocking of lake trout, and early season fishing in shallow waters is providing exciting and productive trout angling again in Lake Superior.

8071. Awachie, J.B.E. 1965. THE ECOLOGY OF ECHINORHYNCHUS TRUTTAE SCHRANK, 1788 (ACANTHOCEPHALA) IN A TROUT STREAM IN NORTH WALES. Parasitology, Vol. 55, Pt. 4. p. 747-762.

The occurrence of Echinorhynchus truttae in its intermediate host, Gammarus pulex, shows a clear seasonal periodicity. In the definitive host, brown trout, the incidence of the worm is more or less uniform throughout the year, but the degree of parasitization is seasonal and correlated with the seasonal variation in the feeding activity of fish. There is no age resistance in trout to infection with the parasite. E. truttae is found along the entire intestinal tract and superimposed infections occur in nature. Main changes in the composition of the population of developmental stages in one host are reflected in the other. The periods when shrimps are born correspond to the maxima in the incidence of acanthors in the environment. (Auth. summary)

8072. Paling, J.E. 1965. THE POPULATION DYNAMICS OF THE MONOGENEAN GILL PARASITE DISCOCOTYLE SAGITTATA LEUCKART ON WINDERMERE TROUT, SALMO TRUTTA, L. Parasitology, Vol. 55, Pt. 4. p. 667-694.

The population of Discocotyle sagittata on brown trout in Windermere has been studied over a 2-year period. The parasite in Windermere invades its host over the period April to November, with the peak in July and August. Young trout in nursery streams do not harbour D. sagittata. Invasion takes place mainly in the deeper waters of the lake. Young parasites are thought to attain sexual maturity on average about 2 months after settling on the host. The parasites in Windermere can live for 3 or 4 years. The older trout bear on average more parasites per fish, and a bigger proportion of them are infected with the parasite, up to a theoretical saturation at 5 or 6 years in both cases. Male trout between the ages of 5 and 7 years inclusive bear significantly more parasites than do the females of comparable age. A different population of D. sagittata exists on brown trout and alpine char in Crummock Water. This population of the parasite lives for 1 year only and infects its hosts mainly over the winter months. The various populations of D. sagittata are thought to represent an intermediate stage in a process of evolution. Differences in life-cycle already exist in distinct populations of D. sagittata, but all the parasites involved are alike morphologically. (Auth. summ.)

8073. Jarvenpa, Oliver. 1965. BETTER SPORT FISHING THRU CHEMISTRY. The Conservation Volunteer, Vol. 28, No. 164. pp. 26-30.

Short history of the discovery and use of rotenone in fishery management work. Minnesota found that treatment of waters with rotenone cost about eleven times as much with toxaphene.

8074. Christenson, D.P. 1965. FISHING FOR FUN... WHAT'S NEW ABOUT THAT? Outdoor California, Vol. 26, No. 10, pp. 3-4.

Brief outline of current program in California. A small number of large trout may be kept on certain of the lakes and streams and such regulations appear to hold promise for added sport, together with a sustained harvest of native trout.

8075. Beland, Dick. 1965. RIGGING FOR KOKANEE. Outdoor California, Vol. 26, No. 10, pp. 8-10.

Harvest data for sample periods from five coldwater reservoirs and three two-story reservoirs in California.

8076. Von Geldern, Charles E., Jr. 1965. THE WHITE BASS IS COMING TO CALIFORNIA. Outdoor California, Vol. 26, No. 10, pp. 14-15.

The California Fish and Game Commission has approved the DFG's request to plant white bass in Nacimiento Lake early in 1966. Both adult and young will be planted and the fish will be obtained from Oklahoma. The department has recommended to the commission that Nacimiento be closed to white bass fishing during 1966 so these fish will have an opportunity to spawn. The DFG anticipates asking the commission to open the lake to white bass fishing in 1967.

8077. Warner, Kendall. 1965. FISHERY MANAGEMENT IN THE FISH RIVER DRAINAGE. Maine Dept. of Inland Fish. and Game, Fishery Research Bulletin No. 6. 52 p.

Results of a study of existing sport fishery resources of a major subdrainage (890 square miles) of the St. John River system. It considers management of the lakes and streams, effects of obstructions (existing and proposed), and pollution. It concludes with a summary of the major findings and a list of seven recommendations developed as a result of the study.

8078. Sykes, James E. 1965. BUREAU OF COMMERCIAL FISHERIES SYMPOSIUM ON RED TIDE. U.S. Fish & Wildlife Service, Special Scientific Report — Fisheries No. 521. 11 p.

In October 1964, the Bureau of Commercial Fisheries held a Red-Tide Symposium at St. Petersburg Beach, Fla. Purposes were to review progress on red-tide research in recent years, to exchange views on the nature of current investigations, and to determine where emphasis should be placed in further studies. Abstracts of presentations by 14 participating scientists are included in this report. Eleven areas of red-tide research were cited as needing attention in continuing studies. (Auth)

8079. Briggs, Philip T. 1965. THE SPORT FISHERY IN THE SURF ON THE SOUTH SHORE OF LONG ISLAND FROM JONES INLET TO SHINNECOCK INLET. New York Fish and Game Journal, Vol. 12, No. 1. pp. 31-47.

The sport fishery in the surf between Jones Inlet and Shinnecock Inlet was studied from April through November each year from 1961 through 1963. During this period the number of anglers increased markedly. The majority (over 70 percent each year) were concentrated between Jones Inlet and Fire Island Inlet, and these anglers caught the most fish and the greatest variety. The catch was dominated by four species: northern puffer, striped bass, northern kingfish and bluefish; but most anglers sought striped bass success for which was highest in spring and fall. Data taken between Jones Inlet and Fire Island Inlet indicated that night anglers generally had higher catches per effort for striped bass and bluefish, the principal species caught, than their daytime counterparts. Variations in abundance and fishing success for the other species are discussed. Because of the increasing popularity of surf fishing in this area, there is need for better access to the beaches east of Fire Island Inlet. (Auth.)

8080. Briggs, Philip T. 1965. THE SPORT FISHERIES FOR WINTER FLOUNDER IN SEVERAL BAYS OF LONG ISLAND. New York Fish & Game Journal, Vol. 12, No. 1. pp. 49-70.

The sport fisheries for winter flounder in Great South Bay, Moriches Bay, Shinnecock Bay, and Gardiners Bay and the Peconic Bays were studied from 1961 through 1963. An average of 193,482 anglers landed an average of 2,665,619 winter flounder each year. Great South Bay attracted the most winter flounder anglers and more winter flounder were caught there than in any of the other bays. In all the bays, the catch, the number of anglers seeking this species and their catch per effort were highest in the spring. There was an indication that recent increases in the abundance of northern puffer resulted in lower-than-usual catches of winter flounder in Great South Bay in the spring. Poor fishing for summer flounder from 1961 through 1963 resulted in extension of winter flounder fishing in the south-shore bays through the summer. Similarly, poor fishing for scup in Gardiners Bay and the Peconic Bays in June 1963 resulted in increased effort for and catches of winter flounder. Large (305 millimeters or more in total length) winter flounder were present in numbers in the catches in the south-shore bays only during spring and fall. There was a consistently greater proportion of these large fish in the catch in Gardiners Bay and the Peconic Bays than in the other waters. Length-weight data revealed that females of given sizes generally outweighed males and that winter flounder were in their poorest condition in the spring when fishing effort and the catch were greatest. Females almost always outnumbered males in the sport catch and the proportion of females tended to become even greater in late fall. It is concluded that the anticipated increase in fishing pressure for this species would be best directed toward expansion of the fall fishery in all the bays and toward increased fishing at all seasons in Gardiners Bay and the Peconic Bays.

8081. Loeb, Howard A., Henriette H. Gettner, and Harold A. Abramson. 1965. EFFECT OF 48 DERIVATIVES OF D-LYSERGIC ACID ON THE SURFACING BEHAVIOR OF LABORATORY FISH. New York Fish & Game Journal, Vol. 12, No. 1. pp. 79-88.

Of 48 derivatives of d-lysergic acid, or ergot derivatives, that were tested on golden shiners and other species of fish, 36 were found to cause surfacing at the concentrations tested. Other symptoms were also noted. It was found that certain species of fish surfaced involuntarily or floated when not moving while in solutions of these drugs. Other species surfaced by positive upward swimming and still others were not affected. Comparative tests on goldfish showed that the compounds varied in effectiveness in relation to concentration. Changes in pH and temperature did not affect the action of the chemicals. It was shown that fish develop immunity to these compounds. Ultraviolet light caused a rapid breakdown of these chemicals, most of which are fluorescent. (Authors)

8082. Hoff, James G., and James R. Westman. 1965. EXPERIMENTS WITH A DIBROM-MALATHION FORMULATION AS A SELECTIVE PISCICIDE. New York Fish & Game Journal, Vol. 12, No. 1. pp. 99-107.

Laboratory bioassay tests were conducted on Dibrom-malathion formulations to determine their comparative toxicities to various fish species. The tests revealed that a mixture containing 3 parts of actual Dibrom and 2 parts of actual malathion (by weight) applied at 0.10 ppm was more toxic to bluegills and pumpkinseeds than to largemouth bass; further, that this formulation did not remain lethally toxic, at this dilution, for more than 3 days. Mortality and crippling were delayed by low temperature. Size and weight of the fish affected mortality, the larger fish being more resistant to the chemical. This piscicide was experimentally tested in five farm ponds and seven lakes. In most instances, upwards of 80 percent of the bluegills and pumpkinseeds were killed. Almost all the largemouth bass killed were fingerlings (young of the year), particularly those of small size. Mortalities as high as 50 percent may have occurred in these fingerlings. The experimental evidence suggests that this formulation could be developed into an effective tool for controlling undesirable populations of bluegills, pumpkinseeds and certain other fishes in many situations. (Authors)

8083. Gutenmann, Walter H., and Donald J. Lisk. 1965. CONVERSION OF 4-(2,4-DB) HERBICIDE TO 2,4-D BY BLUEGILLS. New York Fish & Game Journal, Vol. 12, No. 1, pp. 108-111.

Using electron affinity gas chromatography, the conversion of 4-(2,4-DB) to 2,4-D by bluegills (Lepomis gibbosus) was shown. The conversion occurred only in the presence of the fish and not as a result of other chemical or microbiological activity

in the water resulting from the presence of the fish. (Authors)

8084. Miller, Daniel J., and Daniel Gotshall. (Calif. Dept. Fish and Game, Menlo Park). 1965. OCEAN SPORTFISH CATCH AND EFFORT FROM OREGON TO POINT ARGUELLO, CALIFORNIA JULY 1, 1957 - JUNE 30, 1961. Calif. Dept. Fish and Game Fish Bull. 130, 130 p.

A four-year assessment study of ocean sportfishing effort and catch from Oregon to Pt. Arguello entailed sampling of the five sport fisheries (pier fishing, shore fishing, partyboat fishing, skiff fishing, and skindiving) to determine total catch estimates for an average year by species. These estimated 1,410,000 total angler days, all methods, yielded 3,218,000 fish weighing 4,370,000 pounds. Blue rockfish, white croaker, barred surfperch, and jacksmelt were the primary species by numbers. Longcod, blue rockfish, striped bass, and king salmon were the primary species by weight. Sport data are given for each fishing method by port or sub-area of the coast. One-hundred twenty-five species were recorded in the sport catch. Of the combined commercial and sport catch on the north coast, the sport catch contributed 20 percent. (Authors)

8085. Goodson, Lee F., Jr. (Calif. Dept. Fish and Game, Sacramento). 1965. DIETS OF FOUR WARMWATER GAME FISHES IN A FLUCTUATING, STEEP-SIDED, CALIFORNIA RESERVOIR. Calif. Fish and Game 51(4): 259-269.

A food habits study at Pine Flat Lake in 1963 and 1964 revealed a seasonal abundance of cladocerans, chironomids, terrestrial arthropods, and threadfin shad in the diets of game fishes. Largemouth bass fed principally upon shad the year around although small bass also ate cladocerans. Crappie ate mostly shad except in the spring, when small crappie ate chironomid larvae, cladocerans, and copepods. Catfish consumed chironomid larvae in the spring, shad in late summer and fall, and filaree, a terrestrial plant, in winter. Small catfish ate chironomid larvae from March through October. Bluegill ate all the seasonally abundant foods plus fish eggs in the spring. (Auth.)

8086. Frantz, Ted C. (Nevada Fish & Game Comm., Reno) and Almo J. Cordone (Calif. Dept. Fish and Game, Sacramento). 1965. INTRODUCTION OF THE BONNEVILLE CISCO (PROSOPIUM GEMMIFERUM SNYDER) INTO LAKE TAHOE, CALIFORNIA AND NEVADA. Calif. Fish and Game, 51(4): 270-275.

Bonneville cisco were introduced into Lake Tahoe in 1964 to improve the food supply for lake trout and possibly other species of trout. Few forage fishes occur naturally in Tahoe's deep water areas during summer, and we expect the Bonneville cisco to fill this gap. This cisco is a small, active, plankton feeder, widely distributed and abundant in its native habitat. It lacks parasites, spawns on lakeshores, and prefers colder waters the year around. At Bear Lake, Utah-Idaho, it provides an important dipnet sport fishery. (Authors)

8087. Lowman, Fred G. (Texas Parks & Wildlife Dept., Waco). 1965. A CONTROL FOR CRAYFISH. Progressive Fish-Culturist, 27(4): 184.

Concentrations of 0.25, 0.37, and 0.50 ppm Baytex Spray Concentrate sprayed over ponds with a pressure pump, killed all crayfish in 48 hours but did not affect bluegills. Goldfish, golden shiners, fathead minnows, channel catfish, flathead catfish, mosquitofish, largemouth bass, and other sunfishes showed no distress in ponds treated with 0.37 ppm. Largemouth bass and white crappies showed distress in ponds treated with 0.33 ppm. at high temperatures.

8088. Miller, Jack G. (Penn. Fish Commission, Benner Spring Fish Research Station, Bellefonte). 1965. ADVANCES IN THE USE OF AIR IN TAKING EGGS FROM TROUT. Progressive Fish-Culturist, 27(4): 234-237.

As a refinement of the Australian procedure for taking eggs with air, a spawning table has been designed.

8089. Johnson, M. G. (Metropolitan Toronto and Region Conservation Authority, Woodbridge, Ontario, Canada). 1965. LIMNOLOGY OF ONTARIO PONDS IN RELATION TO WINTERKILL OF LARGEMOUTH BASS. Progressive Fish-Culturist, 27(4): 193-198.

Water quality in 30 Ontario ponds was examined at almost weekly intervals during a very severe winter, 1961-62. Two distinct periods of oxygen decline and increases in ammonia and free carbon dioxide coincided with two periods of snow accumulation on the ponds. Rate of decline and minimum level of oxygen attained were related to increased amount of organic matter in the pond soils and accumulation of snow. Conditions became critical for largemouth bass (Micropterus salmoides) when the oxygen concentration in near-bottom waters was below 1.0 ppm for a number of days, during which time a minimum level, probably less than 0.5 ppm, was ultimately lethal. Increased concentrations of free carbon dioxide, ammonia and hydrogen sulfide may have been accessory factors, but apparently had no effect on the survival of bass. (Auth.)

8090. Davis, Allen S. and Gerald J. Paulik (Fisheries Research Inst., Univ. of Washington, Seattle). 1965. THE DESIGN, OPERATION, AND TESTING OF A PHOTOELECTRIC FISH EGG COUNTER. Progressive Fish-Culturist, 27(4): 185-192.

The design and operation of a photoelectric fish egg counter are described in detail. Statistical methods for controlling the accuracy and precision of the counts are developed. An example of the use of the counter and the statistical methods for counting salmon eggs are included. (Authors)

8091. Erickson, J. David (Snake River Trout Farm, Buhl, Idaho). 1965. REPORT ON THE PROBLEM OF ICHTHYOSPORIDIUM IN RAINBOW TROUT. Progressive Fish-Culturist, 27(4): 179-184.

Observations on Ichthyosporidium infecting rainbow trout have been recorded over a 2-1/2-year period (winter 1962 - summer 1964). Included are: a regional history of the disease, symptomatic and

pathological effects, adverse effect of sublethal infection on growth rate, and possibilities for trout pond disinfection. The severity of the disease is suggested by mortalities and a high percentage of spinal curvature caused by damage to the nervous system. (Auth.)

8092. Avault, James W., Jr. (Auburn University, Agricultural Experiment Station, Auburn, Ala.). 1965. PRELIMINARY STUDIES WITH GRASS CARP FOR AQUATIC WEED CONTROL. Progressive Fish-Culturist, 27(4): 207-209.

Preliminary studies on use of grass carp, Ctenopharyngodon idellus (Cuvier and Valenciennes), for aquatic weed control have recently been completed at Auburn University Agricultural Experiment Station. When stocked at a rate of 685 per acre, the fish eliminated 12 species of weeds growing in plastic-lined pools within 6 weeks. In ponds, three species of rooted weeds were significantly reduced or eliminated in 1 month after being stocked with 20 to 40 grass carp per acre. (Auth.)

8093. Nelson, William R., Norman R. Hines, and Lance G. Beckman (Bur. of Sport Fisheries and Wildlife, Yankton, S.D.). 1965. ARTIFICIAL PROPAGATION OF SAUGERS AND HYBRIDIZATION WITH WALLEYES. Progressive Fish-Culturist, 27(4): 216-218.

Methods used to propagate saugers artifically and to hybridize walleyes and saugers are described. At a water temperature range of 50° - 54° F. sauger eggs began hatching at 9 days and walleye eggs at 13 days. Eggs of both the sauger and the sauger female-walleye malehybrids had a 59% hatching success; eggs of walleye female-sauger male hybrids had a 5% success. Fry of both the sauger and the walleye female-sauger male hybrids developed normally; the sauger female-walleye male hybrids died of unknown causes within 3 days. After 48 days, total length of sauger averaged 63mm. After 95 days, total length of hybrids averaged 127 mm. (Authors)

8094. Gunning, Gerald E. (Dept. of Zoology, Tulane University, New Orleans, La.). 1965. A BEHAVIORAL ANALYSIS OF THE MOVEMENT OF TAGGED LONGEAR SUNFISH. Progressive Fish-Culturist, 27(4): 211-215.

Previous work indicated that a large percentage of the longear sunfish (Lepomis megalotis megalotis) in a given stream pool could be expected to occupy a restricted home range for a considerable time. Experiments were run to determine whether a tagged longear sunfish would move to a greater or lesser extent than, or the same distance as, a fish of the same size that had not been tagged. Three different experimental designs resulted in the same conclusion: no change in behavior with respect to extent of movement after tagging.

8095. Stevenson, James H. (Bur. of Sport Fisheries and Wildlife, Stuttgart, Ark.). 1965. OBSERVATIONS ON GRASS CARP IN ARKANSAS. Progressive Fish-Culturist, 27(4): 203-206.

Early growth of the grass carp (Ctenopharyngodon idellus) at the Fish Farming Experimental Station, Stuttgart, Arkansas, compared favorably with that reported in semitropical countries. The average weight at 18 months was 1,816 grams; the length, 50 centimeters. The fish were given a supplemental ration of commercial fish pellets and cut grass. Observations of the feeding habits indicate that this carp may not be a strict herbivore; it is recommended that a thorough study be made before the fish is released in natural waters. (Auth.)

8096. Merna, James W. (Michigan Dept. of Conservation, Ann Arbor). 1965. AERATION OF WINTERKILL LAKES. Progressive Fish-Culturist, 27(4): 199-202.

Outboard motors were used to pump water over the surface of an ice-covered lake in an attempt to prevent winterkill of fish. The circulation of water over the ice and back into the lake, and the increased photosynthesis resulting from melting the snow cover, increased the dissolved oxygen. Four motors operated for about 3 hours on a 90-acre lake with a maximum depth of 7 feed flooded an area of about 6 acres. Dissolved oxygen content of water samples collected under the ice within the flooded area at a depth of 20 inches increased from an average 2.2 ppm before flooding to 5.9 ppm after flooding. Four days after flooding, oxygen samples taken over the lake surface ranged from 3.1 to 4.8 ppm. This general increase throughout the lake was apparently due to sub-ice circulation resulting from operation of the motors. (Auth.)

8097. Garrison, Robert L. (Oregon State Game Comm., Research Division, Corvallis, Oregon). 1965. COHO SALMON SMOLTS IN NINETY DAYS. Progressive Fish-Culturist, 27(4): 219-220.

Coho fry introduced into a brackish water impoundment at a size of 890 per pound grew to 23 per pound in 90 days without artificial feeding, and were ready to migrate to the sea 141 days after hatching. (Auth.)

8098. Magnuson, John J. (Bur. of Commercial Fisheries Biological Lab., Honolulu, Hawaii). 1965. TANK FACILITIES FOR TUNA BEHAVIOR STUDIES. Progressive Fish-Culturist, 27(4): 230-233.

Inexpensive salt-water tank facilities suitable for behavioral studies of tunas have been constructed by the Bureau of Commercial Fisheries Biological Laboratory, Honolulu. Six circular tanks, 24 feet in diameter and 4 feet deep, are equipped with facilities for use in making and recording behavioral observations. (Auth.)

8099. Menn, Charles T. (Texas Parks & Wildlife Dept., Mathis). 1965. APPRAISAL OF WATER HYACINTH CONTROL WITH 2,4-D SPRAYED FROM HELICOPTERS. Progressive Fish-Culturist, 27(4): 228-229.

An oil-soluble amine of 2,4-D (1 pound of acid equivalent per gallon) in a mixture of 2 gallons of herbicide to 14 gallons of water per acre, was

applied by helicopter to a 50-acre area supporting a dense growth of water hyacinth. Nearly 2 months after the application, most of the plants in the test area were still alive; after a rise in the lake level, plants began to drift to other parts of the lake.

8100. Pentelow, F. T. K., and B. Stott. (Ministry of Agriculture, Fisheries & Food, London, England). 1965. GRASS CARP FOR WEED CONTROL. The Progressive Fish-Culturist, 27(4): 210.

Grass carp (Ctenopharyngodon idella) appeared to control Elodea in a pond in England.

8101. Black, Edgar C., Donald Kirkpatrick, and Harold H. Tucker (Dept. of Physiology, Dalhousie Univ., Halifax, N.S.). 1965. OXYGEN DISSOCIATION CURVES OF THE BLOOD OF BROOK TROUT (SALVELINUS FONTINALIS) ACCLIMATED TO SUMMER AND WINTER TEMPERATURES. Jour. Fish. Res. Bd. of Canada, 23(1): 1-13.

The respiratory function of the blood of brook trout, acclimated to summer and winter conditions, was investigated at various temperatures and at various tensions of carbon dioxide. The marked sensitivity of hemoglobin to carbon dioxide served to offset the influence of lower temperature upon the equilibrium of oxygen and hemoglobin. There did not appear to be any adaptation of the Bohr effect to differences in acclimation temperatures. (Authors)

8102. Hammond, Brian R., and Cleveland P. Hickman, Jr. (Dept. of Zoology, Univ. of Alberta, Edmonton, Alberta, Canada). 1965. THE EFFECT OF PHYSICAL CONDITIONING ON THE METABOLISM OF LACTATE, PHOSPHATE, AND GLUCOSE IN RAINBOW TROUT (SALMO GAIRDNERI). Jour. Fish. Res. Bd. of Canada, 23(1): 65-83.

Physiological effects of physical conditioning to water current were studied on three groups of 1-1/2-year-old rainbow trout, Salmo gairdneri, acclimated to 4°C. Group one (control) was raised in still water. Groups two and three were conditioned to water velocities of 20 cm/sec and 40 cm/sec, respectively, for 16 days before sampling. Muscle and plasma samples were collected before exercise and four times during subjection to 15 min of forced swimming at 53.4 cm/sec and eight times during a 24-hr recovery period. Conditioning significantly delayed the point of fatigue during forced exercise: the unconditioned fish were fatigued after about 5 min swimming, group two after about 10 min swimming, and group three at about 15 min. Physically conditioned trout showed significantly higher muscle and plasma lactate levels when fatigued, and more rapid removal of lactate from muscle and plasma during recovery from fatigue than unconditioned trout. Exercise resulted in parallel oscillating concentration fluctuations of tissue phosphate and significant increases in concentrations of plasma phosphate in both conditioned and unconditioned fish. Plasma glucose showed no significant change during exercise but rose slightly during the recovery of all groups. (Authors)

8103. Andrews, C. W. (Dept. of Biology, Memorial Univ. of Newfoundland, St. John's, Nfld., Canada). 1965. GROWTH OF YOUNG ATLANTIC SALMON, SALMO SALAR, IN THE GANDER RIVER SYSTEM, NEWFOUNDLAND. The Canadian Field-Naturalist, 79(4): 230-239.

The Gander River system, perhaps one of the best salmon producing areas in the whole of Newfoundland, is almost completely free of either man-made or natural obstructions and has available extensive spawning grounds. A study of length composition reveals no significant difference ($P > 0.05$) in growth between upper and lower Gander River. When length is plotted against age only slight variations exist for a given age group between the upper and lower Gander River samples. The dominant age-class of 2+ and 3+ years indicate that most smolts in the Gander River migrate to sea in the spring of the fourth year. The fact that Gander River parr tend to stay in the river somewhat longer than west coast Newfoundland and Miramichi parr is in all probability related to size at smoltification. As a working approximation an arbitrary dividing line between large parr, likely to become smolts next spring and small parr, not likely to, has been set at about 10 cm. or 4 in. total length, measured from tip of snout to tip of tail. Climatic influence in eastern Newfoundland, particularly the influence of the Labrador Current on temperature conditions would, it seems, tend to delay reaching the prescribed length of Elson as compared with points farther west.

8104. Jenkins, Robert M. (Bur. Sport Fisheries and Wildlife, Fayetteville, Ark.). 1965. BIBLIOGRAPHY ON RESERVOIR FISHERY BIOLOGY IN NORTH AMERICA. U.S. Fish and Wildlife Service Research Report 68. 57 p.

This bibliography on reservoir fishery biology comprises 1,210 references under 14 general subject headings. Within subject categories, citations are arranged alphabetically by authors, without cross-indexing or multiple listing. Subject headings are age and growth, bibliographies, diseases and parasites, food habits, harvest rates, life history and ecology, biological limnology, physicochemical limnology, management technique evaluation, methodology and technique development, population dynamics, summaries of management and research, comprehensive or general fishery surveys, and systematics and distribution. The references include many graduate theses and dissertations, mimeographed State fishery agency administrative reports, and Federal Aid (D-J) job completion reports concerning reservoirs. (Auth.)

8105. Regier, Henry A. (Biometrics Unit, Cornell Univ., Ithaca, N.Y.). 1966. A PERSPECTIVE ON RESEARCH ON THE DYNAMICS OF FISH POPULATIONS IN THE GREAT LAKES. Progressive Fish-Culturist, 28(1): 3-18.

Progress on eight major problems in Great Lakes fishery research is reviewed. The problems selected for discussion concern deep-water ciscoes, lake trout, sea lamprey, walleye, smallmouth bass, splake, lake whitefish, blue pike, and lake herring. Differences in research approach by various agencies are examined. Relatively little quantitative

information on population dynamics is available. For some species, sufficient life-history data are available to permit properly designed studies on dynamics. A major need is a comprehensive synthesis of available information and a re-examination of the many proposed explanations of the violent fluctuations in abundance of most stocks in the lakes. (Auth.)

8106. Seaman, Elwood A. (U. S. Air Force, Washington, D. C.). 1966. NYLON LINES AND TAPE FOR BIRD CONTROL. Progressive Fish-Culturist, 28(1): 18.

Nylon fishing lines across a pond at a private trout hatchery near Munich, Germany, curtailed losses from seagulls.

8107. Stevens, Robert E. (South Carolina Wildlife Resources Dept., Moncks Corner, S. C.). 1966. HORMONE-INDUCED SPAWNING OF STRIPED BASS FOR RESERVOIR STOCKING. Progressive Fish-Culturist, 28(1): 19-28.

During the 1964 spawning season, 383 female striped bass (Roccus saxatilis) were injected with hormones at the Moncks Corner Striped Bass Hatchery, 337 (88%) were induced to ovulate, and 317 were spawned successfully in the hatchery for a yield of 322 million eggs and a hatch of 100 million fry. Chorionic gonadotropin was the most successful hormone used. Approximately 60 million fry were stocked in Wateree Reservoir, a 13,000-acre impoundment, and early seining results indicated a substantial survival. (Auth.)

8108. Pyle, Earl A. (Bur. of Sport Fisheries and Wildlife, Cortland, New York). 1966. THE EFFECT OF GRADING ON THE TOTAL WEIGHT GAINED BY THREE SPECIES OF TROUT. Progressive Fish-Culturist, 28(1): 29-32.

Experiments during a 3-year period failed to show beneficial effects on the total weight gained by brook, brown, or rainbow trout after they were graded into relative size groups. Grading is not suggested as a means of increasing trout growth; but cannibalism, demands of management, and the effect of variation in fish size on hatchery management procedures may justify the cost of grading under local hatchery conditions. (Auth.)

8109. Meyer, Fred P. (Bur. Sport Fisheries and Wildlife, Stuttgart, Arkansas). 1966. A NEW CONTROL FOR THE ANCHOR PARASITE, LERNAEA CYPRINACEA. Progressive Fish-Culturist, 28(1): 33-39.

Four weekly applications of 0.25 p.p.m. Dylox® effectively controlled larval and adult stages of the anchor parasite, Lernaea cyprinacea, with only temporary adverse effects on the pond biota. Elevated water temperatures reduced the effectiveness of the compound. Tolerance values established for goldfish, golden shiners, fathead minnows, and channel catfish indicate threshold levels to exceed 40 p.p.m. (Auth.)

8110. McConnell, William J. (Arizona Coop. Wildlife Research Unit, Univ. of Arizona, Tucson). 1966. PRELIMINARY REPORT ON THE MALACCA TILAPIA HYBRID AS A SPORT FISH IN ARIZONA. Progressive Fish-Culturist, 28(1): 40-46.

Production of large numbers of the Malacca Tilapia mossambica (Peters) hybrid in large heated tanks proved feasible. Hybrid fry stocked in small ponds near Tucson, Arizona, provided good fishing for 4-oz fish in 100 days. Most hybrids reached a weight of 8 oz in 150 days; many exceeded 10 oz within 170 days. All hybrids stocked were killed when water temperatures dropped below 55° F in late November or early December. When hybrids received supplementary feeding they made rapid growth at a stocking density of 1,800 fry per acre. When estimation of total harvest was possible, population weight gains exceeding 700 lbs per acre were made in 185 days. Survival of fry exceeded 70% in some renovated or new ponds, and 30% in a pond already containing green sunfish. (Auth.)

8111. Knittel, M. D. (Oregon Fish Comm. Res. Laboratory, Clackamas, Oreg.). 1966. TOPICAL APPLICATION OF MALACHITE GREEN FOR CONTROL OF COMMON FUNGUS INFECTIONS IN ADULT SPRING CHINOOK SALMON. Progressive Fish-Culturist, 28(1): 51-53.

Topical application of a 10% solution of malachite green was shown to be an effective treatment for fungus-infected lesions of adult chinook salmon (Oncorhynchus tshawytscha). (Auth.)

8112. Volz, Charles D., and Chester O. Wheeler. (Bur. of Commercial Fisheries, Seattle, Wash.). 1966. A PORTABLE FISH-TATTOOING DEVICE. Progressive Fish-Culturist, 28(1): 54-56.

A lightweight, portable fish-tattooing device is described and illustrated. It will operate on 12-volt storage batteries, dry cells, or from the a. c. mains with a transformer-rectifier combination. It is effective, easy to operate and maintain, and free from electrical shock hazard. (Auth.)

8113. Nakamura, Eugene L. (Bur. of Commercial Fisheries Biological Lab., Honolulu, Hawaii). 1966. FIBERGLASS TANKS FOR TRANSFER OF PELAGIC FISHES. Progressive Fish-Culturist, 28(1): 60-62.

Five elliptical tanks, each 8 feet long, 6 feet wide, and 2 feet deep, with a volume of 602 gallons, were constructed of fiberglass. These were used successfully for transferring live tunas from the sea to shoreside pools. The tanks, their cost, use, advantages, and disadvantages, are described in detail. (Auth.)

8114. McCann, James A. (Iowa Coop. Fishery Research Unit, Ames, Iowa). 1966. A SIMPLE TRANSPORTABLE LAKE SHOCKER. Progressive Fish-Culturist, 28(1): 63-64.

An easily transportable lake shocker is described. It is powered by a 150-volt a. c. generator and can be operated efficiently by two people. (Auth.)

8115. Kondo, Masato. 1963. MASSIVE DESTRUCTION OF FISHES DUE TO ABNORMAL CONDITION OF THE SEA WATER IN WESTERN JAPAN IN

WINTER, 1963. Bull. Seikai Regional Fisheries Research Lab. No. 29. pp. 97-107.

The writer investigated the massive destruction of fishes in various areas along the coast of Western Japan during January to April, 1963. Although death or inactivity mainly occurred to the demersal fishes, the pelagic species also were not free from them. Some of the fish affected were found swimming on or near the sea surface in a normal position but feebly, while others on their side or upside down and in a debilitated manner. The amount of such fishes gathered in one day by one person in some cases came to as high as 450 kg. and the most numerous was Stephnolepis cirrhifer, followed by Siganus fuscescens, Callyodon ovifrons, Kyphosus lembus, Lethrinus haematoperus, and Gerrs oyena in that order. In various places along the coast, it was noted that temperature of the sea water suddenly began to drop in the latter half of January, 1963, and showed from 1.5° to 4.0° C., lower than the normal, to the end of April. The greatest number of deaths or suspended animation took place in February when the water temperature registered the lowest point in the year. The phenomenon of such a sudden drop in the temperature of the sea water has not been seen there in recent years. Based on the foregoing facts, it may be considered that the death of such a great number of fishes along the coastal areas is caused by the unusually low temperature of the sea water. (From Auth. Synopsis)

8116. Feldmann, R.M. (Dept. Geol., Univ. N. Dak., Grand Forks, N.D.). 1963. DISTRIBUTION OF FISH IN THE FOREST RIVER OF NORTH DAKOTA. Proc N. Dak. Acad. Sci., 17: 11-19. Map.; Biological Abstracts, Vol. 45, No. 24, Abst. No. 103101. 1964.

Collections from 11 stations show 23 species, a few with preference for mud or sand bottom. --O.A. Stevens.

8117. Allison, Donald T. (Fish-Pesticide Res. Lab., Jackson, Wyo.), Burton J. Kallman, Oliver B. Cope, and Charles Van Valin. 1964. SOME CHRONIC EFFECTS OF DDT ON CUTTHROAT TROUT. U.S. Fish & Wildlife Service Research Report 64. 1-28. Illus.

Effects on cutthroat trout (Salmo clarki lewisi) of periodic exposure to different levels of DDT in bath and in food were determined over a 20-month period involving one spawning cycle. High dosages produced a marked increase in mortality, probably by reducing resistance to nonspecific stressors; surviving fish in high-dosage lots were significantly larger than those in control and low-DDT lots. This effect occurred with no change in growth rate, perhaps because of removal of smaller and less vigorous fish by DDT. The number and volume of eggs produced was not reduced by DDT, but mortality among sac-fry appeared to be highest in the high-dosage lots. The reproductive potential of fish treated at high levels was reduced by high rates of mortality among adults and in sac-fry from survivors. Intermediate and low dosages of DDT generally did not measurably affect mortality, growth, or reproductive potential, indicating that a threshold level exists around 0.1 ppm monthly in contact form and around 0.3 mg. DDT per kg of fish weekly in the diet for the toxic effects of DDT. Metabolic conversion of DDT to DDE occurred to a greater relative extent in fish exposed to low dosages; at these levels, total residues of chlorinated hydrocarbon were not higher than in controls. Residues of DDD were present in most of the fish, possibly as a metabolite of DDT. These data suggest that the usual control treatment exposures to sublethal levels of DDT are unlikely to damage a population of cutthroat trout. (Auth.)

8118. Bauer, O.N. 1962. MODERN METHODS IN THE CONTROL OF FISH DISEASE IN POND HATCHERIES. (SOVREMENNYE METODY BOR'BY S BOLEZNYAMI RYB V PRUDOVOM KHOZYAISTVE). Tr Soveshch Ikhtiol Komis Akad Nauk SSSR 14. 196-200; Referat. Zhur., Biol., 1963, No. 7I70, (Translation); Biological Abstracts, Vol. 45, No. 24, Abst. No. 103123. 1964.

Methods are described in controlling ichthyophthiriasis, chilodonelliasis, dactylogyrosis and contagious dropsy. Methods for controlling sporozoan diseases were insufficiently developed, and particularly for myxosporidiosis. Experiments conducted in the Fish Disease Laboratory of the State Research Institute for Lake and River Fisheries (GosNIORKL) are described, with the application of different doses of levomycetin and synthomycin against dropsy.

8119. Boyd, Claude E., and Denzel E. Ferguson. (Dept. Zool., Miss. State Univ., State College, Miss.). 1964. SUSCEPTIBILITY AND RESISTANCE OF MOSQUITOFISH TO SEVERAL INSECTICIDES. J. Econ. Entomol. 57(4): 430-431; Biological Abstracts, Vol. 45, No. 24, Abst. No. 103126. 1964.

Approximate LD_{50} values for DDD, endrin, aldrin, dieldrin, toxaphene, heptachlor, and lindane were determined for 4 populations of mosquitofish, Gambusia affinis affinis (Baird and Girard). The results show resistance and crossresistance in populations having past exposure to insecticides. Evidence favoring a genetic basis for resistance is presented wherein toxicity levels remained constant in progeny of resistant fish which were reared in the absence of insecticides. (Authors)

8120. Delacy, Allan C., Charles R. Hitz (Bur. Commercial Fish., Seattle, Wash.), and Robert L. Dryfoos. 1964. MATURATION, GESTATION, AND BIRTH OF ROCKFISH (SEBASTODES) FROM WASHINGTON AND ADJACENT WATERS. Wash. Dept. Fisheries, Fish Res. Paper 2(3): 51-67. Illus.; Biological Abstracts, Vol. 45, No. 24, Abst. No. 103131. 1964.

Ova of brown rockfish (Sebastodes auriculatus) and copper rockfish (S. caurinus) mature during the winter; embryos develop and are released in spring; in summer and fall the ovary prepares for repetition of the reproductive cycle. Most female brown rock-

fish carry embryos in May; most copper rockfish in April. Length-fecundity relationships are presented for these two species. The latter achieves the greater fecundity. A volumetric method of estimating fecundity was used and its variability evaluated. Thirteen species of rockfish larvae are differentiated on the basis of pigment distribution, and illustrations of larvae for 9 of these species are presented. Among 18 species of adult rockfish sampled there were indications that their spawning seasons differ. -- A. C. Delacy

8121. Houser, Alfred. (Fishery Res. Lab., Norman, Okla.). 1962. A TROUT FISHERY IN OKLAHOMA. Proc. Okla. Acad. Sci. 42: 272-274; Biological Abstracts, Vol. 45, No. 24, Abst. No. 103138. 1964.

Rainbow trout Salmo gairdneri obtained from the Fish and Wildlife Service were stocked in the newly constructed Lake Carl Etling near Boise City, Oklahoma in 1959. An account of all management measures applied to this fishery since impoundment through the first fishing season, held in 1961, and the rate of exploitation are presented. (Auth.)

8122. Kol'gaev, A. M. 1962. DURATION OF THE INCUBATION PERIOD IN THE DEVELOPMENT OF AUTUMN CHUM (ONCORHYNCHUS KETA) SPAWN, INCUBATING ON TRAYS AND IN GRAVEL. (PRODOLZHITEL'NOST' INKUBATSIONNOGO PERIODA RAZVITIYA IKRY OSENNEI KETY PRI INKUBATSII EE NA RAMKAKH I V GRUNTE). Izbest Tikhookeansk Nauchn Inst RYBN Khoz Okeanogr 48: 207-209; Referat. Zhur., Biol., 1963, No. 7I61. (Translation); Biological Abstracts, Vol. 45, No. 24, Abst. No. 103143. 1964.

The effect of various conditions on duration of hatching of autumn chum embryos was experimentally investigated. With incubation of the spawn in gravel, the embryos hatched 7-9 days later than in the tray equipment, although the spawn was washed in both cases by the same water. Premature and quick hatching of the embryos in the rearing trays, in comparison with the hatching on the bottom, was caused by unfavorable conditions. Such embryos had a lower viability.

8123. Sandoz, O'Reilly. 1962. TILAPIA GROWTH AND PRODUCTION AT THE MEDICINE PARK FISH HATCHERY. Proc Okla. Acad. Sci. 42: 280-283; Biological Abstracts, Vol. 45, No. 24, Abst. No. 103163. 1964.

During the summer of 1961, Tilapia mossambica was cultured experimentally at the Medicine Park Fish Hatchery, Medicine Park, Oklahoma. In a 0.23-acre pond 32 brooders produced about 60 pounds of fish consisting of about 3,800 individuals in a period of 138 days. The production and increase in weight and length of the brooders in the presence of predaceous species prompts the continuation of the experiment in the 1962 growing season. (Auth.)

8124. Topp, Robert. (630 Cordova Blvd., N.E., St. Petersburg, Fla.). 1963. THE TAGGING OF FISHES IN FLORIDA 1962 PROGRAM. Florida State Board Conserv. Prof. Paper Ser. 5. 1-76. Illus. Map.; Biological Abstracts, Vol. 45, No. 24, Abst. No. 103169. 1964.

Sixty-four species totalling 5,155 fishes were released. Fishes tagged inshore yielded 18.1% returns, fishes tagged offshore 15.1% returns. Valuable pilot research was obtained for red snapper (Lutjanus aga), gag (black grouper) (Mycteroperca microlepis) and red grouper (Epinephelus morio). Offshore fishes clung to specific residences seasonally. Hydrostatic swimbladder imbalances, predation and accurate assessment of movement were major tagging problems offshore. Because of their being permanent and non-irritating, internal tags proved superior to Petersen tags with nickel pins for unbiased, long-range studies. Drying and freezing caused length decreases greater than 2%. (Auth.)

8125. Cairns, John Jr., and Arthur Scheier. (Acad. Nat. Sci., Philadelphia, Pa.). 1964. BLOOD CORPUSCLE COUNT, HEMOGLOBIN CONCENTRATION AND OXYGEN CONSUMPTION VALUES FOR THE PUMPKINSEED SUNFISH LEPOMIS GIBBOSUS (LINN.). Notulae Nat. (Philadelphia) 366. 1-4; Biological Abstracts, Vol. 45, No. 24, Abst. No. 104013. 1964.

Blood corpuscle count averaged 2,292,400 cells/aq. mm. with a range of 1,178,000 - 2,760,000 for 25 specimens, with hemoglobin concentration averaging 10.15 g./100 ml. with a range of 7.06-14.08 for 20 specimens. The average O_2 consumption during 20 min. of activity was 7.65 milligrams with a range of 5.4-9.3 mg. for 23 fish tested. (Auth. Abst.)

8126. Courville, Cyril B., Donovan A. Courville, and Bruce W. Halstead. (1720 New Jersey St., Los Angeles, Calif.). 1963. CIGUATERA: A NEUROTOXIC FISH POISONING. Trans. Amer. Neurol. Assoc., 88: 204; Biological Abstracts, Vol. 45, No. 24, Abst. No. 104768. 1964.

8127. Ulitzur, S., and M. Shilo. (Hebrew Univ. - Hadassah Med. Sch., Jerusalem, Israel). 1964. A SENSITIVE ASSAY SYSTEM FOR DETERMINATION OF THE ICHTHYOTOXICITY OF PRYMNESIUM PARVUM. J. Gen. Microbiol. 36(2): 161-169; Biological Abstracts, Vol. 45, No. 24, Abst. No. 104792. 1964.

The activity of Prymnesium parvum ichthyotoxin and its dependence on various cofactors was studied. Spermine or other polyamines have a marked synergistic effect on the ichthyotoxic activity. Of the cations studied, Ca^{2+} and Mg^{2+} increased ichthyotoxic activity, while Na^{+} inhibited. Changes in pH value had a profound influence, ichthyotoxicity increasing at least 400-fold as the pH value was increased from 7 to 9. A sensitive bioassay for the estimation of P. parvum ichthyotoxin was developed for use in the laboratory and under field conditions. (Authors)

8128. Magnin, Étienne. (Lab. Zool., Univ. Lyon, Lyon, France). 1962. RESEARCH CONCERNING SYSTEMATICS AND BIOLOGY OF THE STURGEONS

ACIPENSER STURIO, A. OXYRYNCHUS AND A. FULVESCENS. (RECHERCHES SUR LA SYSTEMATIQUE ET LA BIOLOGIE DES ACIPENSERIDES, ACIPENSER STURIO L., ACIPENSER OXYRHYNCHUS MITCHILL ET ACIPENSER FULVESCENS RAF.) Ann. Sta. Ctr. Hydrobiol. Appl. 9: 7-242. Illus. Map. (recd. 1964); Biological Abstracts, Vol. 45, No. 24, Abst. No. 107012. 1964.

On the basis of structure, A. sturio and A. oxyrhynchus differ specifically. Both are anadromous Atlantic spp.; the former is European and the latter is American. A. fulvescens is American and dwells in fresh-water. There has been no question of its specific differences from the other 2 spp. All of the Acipenseridae are confined to the Northern Hemisphere. Some of the generalities of the distribution of the 4 genera of the family are discussed. More detail is given of the distribution of the 3 spp. under special consideration. Chapters are devoted to the growth, migrations, food, or osmoregulation, and reproduction of the 3 spp. Age can be determined by thin sections of the 1st ray of the pectoral fin. Specimens were observed in this study as old as 60 years. Growth continues throughout life. The 2 Atlantic spp. migrate up the rivers to spawn, and the young migrate back to the sea. A. fulvescens is more sedentary. Food primarily consists of bottom invertebrates, and hence varies from fresh-water to salt-water, and from place to place. Chlorine Na and Mg levels in the plasma augment as the young migrate to the sea, and these salts decrease when the adults migrate to fresh-water. Analysis of the mineral content of the urine indicates that as far as renal excretion is concerned, the sturgeons behave like the glomerular teleosts in comparable environments (fresh water: sea water). Maturity is reached in A. sturio at about 14-15 years in males and 18-20 years in females. In A. oxyrhynchus the corresponding ages are 22-24 and 27-28 years, and in A. fulvescens, 17-18 years and 21-22 years. --C. C. Davis.

8129. Margolis, L. (Fish. Res. Bd. Canada, Biol. Sta., Nanaimo, B. C., Canada). 1964. PAURORHYNCHUS HIODONTIS DICKERMAN, 1954 (TREMATODA: BUCEPHALIDAE): A SECOND RECORD INVOLVING A NEW HOST AND LOCALITY IN CANADA. Canadian Jour. Zool. 42(4): 716; Biological Abstracts. Vol. 45, No. 24, Abst. No. 106785. 1964.

P. hiodontis was found in the body cavity of goldeye (Hiodon alosoides).

8130. Lebedeva, G. D. 1962. MAIN PATHWAYS OF SR^{89} MIGRATION IN ORGANISM OF BENTHOS-FEEDING FISH IN A FRESH-WATER RESERVOIR. U.S. Atomic Energy Comm. Res. Develop. Rept. AEC-tr-5428. 62-71; From: Radiobiologiya 2(1): 1962; Biological Abstracts, Vol. 46, No. 1, Abst. No. 360. 1965.

Penetration of Sr^{89} into the organism of benthos-feeding fish (carp) found in a contaminated body of water (where the specific activity of the water is as high as 5.10^{-7} curies/liter) takes place mainly (to the extent of 60-75%) from the water, not from the food. (Auth.)

8131. Agapova, A. I. 1963. PARASITE CHANGES IN FISH ACCLIMATIZED IN KAZAKHSTAN. (IZMENENIYA PARAZITOFAUNY U RYB, AKKLIMATIZIROVANNYKH V KAZAKHSTANE). In: Akklimatizatsiya zhivotnykh v SSSR. (Acclimatization of animals in the USSR). Akad. Nauk Kazaksk. SSR: Alma-Ata. 336-337; Referat. Zhur., Biol. 1963, No. 23I74. (Translation); Biological Abstracts, Vol. 46, No. 1, Abst. No. 532. 1965.

The parasite fauna of fishes that were acclimatized in waters lacking closely related species was very few during the 1st years (bream, barbel, tench). Parasites also disappeared when the abundance of acclimatized fishes remained low for an extended period of time. These fishes, however, become infested with parasites of local species (bream, barbel, tench, spiny sturgeon). Parasites brought in by a host can become acclimatized and can subsequently infest local species (Ergasilus sieboldi in the Balkhask-Ili basin, Ichthyophthirius in Alma-Ata pond fisheries).

8132. Chumakov, K. A. 1963. BEHAVIOR OF FISH DURING A FLOOD. (POVEDENIE RYB PRI NAVODNENII). Priroda 52(10): 91; Biological Abstracts, Vol. 46, No. 1, Abst. No. 545. 1965.

During Aug. floods on the Ugra River the author noted that small fish abandon the river channel in favor of floodplain shallows, in which the supply of food is more abundant. It was also found that larger carnivores, such as the pike, soon follow this displacement of their prey. --B. Le Bental.

8133. Domanevskii, L. N. (Baltic Res. Inst. Mar. Fish. and Oceanog., Kaliningrad, Kaliningrad Oblast, USSR). 1963. CHARACTERISTICS OF THE GROWTH OF PIKE (ESOX LUCIUS L.). (OSOBENNOSTI ROSTA SHCHUKI (ESOX LUCIUS L.)). Zool. Zhur. 42(10): 1539-1545. Illus.; (English summ.); Biological Abstracts, Vol. 46, No. 1, Abst. No. 547. 1965.

Pike grow better in limnetic waters (lakes, ponds, water reservoirs) than in rivers located in the same latitudes. Individuals which do not attain maturity in the current year have a longer period of growth. The shortest periods of growth are found in mature fishes having participated in spawning. With age, a relative role of the weight of gonads in the yearly sum-total gain of weight of the fish increases. In year-classes and single individuals with a better growth the increase of gonad growth proceeds more rapidly and their values are higher in similar year cycles. Growth rate of the pike depends upon the yield of other fishes. (Auth.)

8134. Fedii, S. P. 1961. NEGATIVE EFFECT OF INDUSTRIAL WASTE WATERS ON THE FLORA AND FAUNA OF KAKHOVSK RESERVOIR AND METHODS OF REMOVAL. (OTRITSATEL'NOE VLIYANIE PROMYSHLENNYKH STOCHNYKH VOD NA FLORU I FAUNU KAKHOVSKOGO VODOKHRANILISHCHA I PUTI EGO USTRANENIYA). In: Trudy vsesoyuznogo soveshchaniya po biologicheskim

osnovam rybokhozyaistvennogo osvoeniya vodokhranilishch, 1958. (Transactions of the All-Union Conference on Biological Principles of fishery application of reservoirs, 1958). Akad. Nauk SSSR: Moscow-Leningrad. 92-95; Referat. Zhur., Biol., 1963, No. 7D272. (Translation); Biological Abstracts, Vol. 46, No. 1, Abst. No. 550. 1965.

Protecting reservoirs from pollution requires complex sanitary and hydrobiological studies and the development of new, acceptable standards of pollutant disposal in a manner suitable for the fishing industry. Both domestic sewage and waste waters from metallurgical, chemical, and food industry plants (a total of 415,000 m^3 daily) are discharged into the Kakhovsk reservoir. The result is a negative disturbance of the organoleptic properties of the water, a disturbance of the activities of organisms, and a steady lowering of the density of the fish population and marine vegetation. The accumulation of comparatively small amounts of pollutants in the industrial effluent dispersal zone is especially dangerous. These facts prove conclusively that domestic sewage and industrial effluents should not be discharged into reservoirs without preliminary purification.

8135. Fox, Charles K. 1965. GUIDE TO STREAM IMPROVEMENT. Sports Afield, 154(2): 30-31, 56-59.

A diagram and discussion of several constructed improvements to increase the carrying capacity of a trout stream. The loss of many miles of former trout waters to pollution stresses the need for making the remaining streams more productive and self sustaining.

8136. Il'ina, L. K. 1962. EFFECT OF THE 1960 WATER LEVEL ON THE SPAWNING OF FISHES IN RYBIN RESERVOIR. (VLIYANIE VYSOTY UROVNYA NA NEREST RYB V RYBISKOM VODOKHRANILISHCHE V 1960 g). Byul Inst. Biol. Vodokhran Akad Nauk SSSR 13. 26-30; Referat. Zhur., Biol., 1963, No. 17I31. (Translation); Biological Abstracts, Vol. 46, No. 1, Abst. No. 555. 1965.

In 1960 the water level in Rybin reservoir was 2 m lower than in 1959. As a result, conditions for the spawning of a number of species deteriotated. Spawning success was estimated from the number of spawners with uncast spawn, as well as from the abundance of young of various fish species. Good agreement between the 2 indices was obtained. Reduction of the spawning area had the greatest effect on Blicca bjoerkna, Abramis brama, Leuciscus idus and Esox lucius; spawning of Rutilus rutilus and Perca fluviatilus was nearly normal. The greater part of the brood stock of A. brama and Stizostedion lucioperca cast their spawn, and their young were encountered practically everywhere in the reservoir. For a low water level, best conditions for spawning were observed in the Sheksna inlet, off the Babin Islands, off Gayutino and in Korotovo Bay.

8137. Parin, N. V. (Inst. Oceanol., Acad. Sci. USSR, Moscow, USSR). 1963. PREDATORS OF THE SEAS AND THEIR ECONOMIC IMPORTANCE. (KHISHCHNIKI MOREI I IKH PROMYSEL). Priroda 52(12): 62-68. Illus. Map.; Biological Abstracts, Vol. 46, No. 1, Abst. No. 584. 1965.

Discussion of the predatory habits of sharks. The utilization of shark meat, shark liver oil, shark fins, and shark skin is considered. The effects of sharks on the tuna industry are described together with methods for foiling their attacks. Man-eating sharks and factors affecting their attacks are discussed, and chemical repellents and biological and mechanical protective measures are considered. The author believes that none of the methods currently used is completely effective. --M. M. Das

8138. Turygin, V. V. 1963. THE CEPHALIC ARTERIAL SYSTEM IN CARTILAGINOUS FISHES (SHARK, SKATE). (ARTERIAL'NAYA SISTEMA GOLOVNOGO MOZGA KHRYASHCHEVYKH RYB (AKULA, SKAT)). Tr Kafedry Norm Anat Cheloveka-Chelyabinsk II Med Inst 2. 54-61; From: Ref. Zh. Biol., 1964, No. 9I15. (Translation); Biological Abstracts, Vol. 46, No. 1, Abst. No. 1381. 1965.

The arterial supply to the brain is described in detail from data on 10 dogfish and 6 thornback rays. On entering the brain cavity, each paired carotid artery divides into an optic and encephalic carotid artery. The encephalic carotid artery runs dorsally and divides (in the shark at the surface of the optic chiasm, in the skate somewhat caudally) into a nasal and caudal branch. The former conveys blood to the forebrain and the diencephalon. In the dogfish an important role in supplying the rhinencephalon is played by the branches which diverge from the nasal artery (where it traverses the olfactory nerve) and pass in the opposite direction. In skate such branches are rarely seen. The caudal branch runs backward, curves around the vascular sac and, in the dogfish, anastomoses with a like branch on the opposite side to form the main brain artery which transmits blood to the medulla oblongata. In skate the main artery is formed considerably more caudally, almost in the region where the medulla oblongata passes into the spinal cord. The caudal artery supplies the medulla oblongata, the mid-brain and the cerebellum; in the dogfish it partially supplies the diencephalon also. Thus, in both the dogfish and the skate there is formed at the base of the brain a circle of Willis with anterior communicating arteries (primitive type).

8139. Shnarevich, I. D. 1960. ON THE EFFECT OF DIFFERENT PARTS OF THE VISIBLE SPECTRUM UPON THE GROWTH AND DEVELOPMENT OF THE BROOK TROUT (SALMO TRUTTA FARIO) DURING THE EMBRYONIC PERIOD. (O VLIYANII RAZLICHNYKH UCHASTKOV VIDIMOI CHASTI SPEKTRA NA ROST I RAZVITIE RUCH'EVOI FORELI V EMBRIONAL'NYI PERIOD). Nauch Ezhegodnik Za 1959 G Chernovitskii Univ Biol Fak 428-430. From: Ref. Zhur. Biol., 1964, No. 4I38. (Translation); Biological Abstracts, Vol. 46, No. 1, Abst. No. 2407. 1965.

Five series of experiments were conducted: in daylight, in darkness, in the presence of red, green, and blue light. It was established that irradiation

with short waves of the spectrum causes high mortality of embryos in early stages of ontogenesis (fission). The rate of morphogenesis in the gastrulation stage depends upon the irradiation of embryos with the short-wave portion of the spectrum. Red light and darkness exert a stimulating effect during later developmental stages. Short waves inhibit hatching and cause high mortality of larvae.

8140. Soin, S. G. (Moscow State Univ., Moscow, USSR). 1963. REPRODUCTION AND DEVELOPMENT IN THYMALLUS ARCTICUS BAICALENSIS DYBOWSKI. (O RAZMNOZHENII I RAZVITII CHERNOGO BAIKAL'SKOGO KARIUSA (THYMALLUS ARCTICUS BAICALENSIS DYBOWSKI). Zool. Zhur 42(12): 1817-1840. Illus. (English summ.); Biological Abstracts, Vol. 46, No. 1, Abst. No. 4517. 1965.

The spawning grounds are small swift rivers emptying into l'Baikal. The slightly sticky eggs are spawned on a stony bottom and the current carries them under the stones. The diameter of hardened eggs averages 4.3 mm with the envelope and 3.0 mm without it. Development proceeds at a temperature of 6-9°. The embryos leave the envelope after 15-20 days; yolk resorption is complete at 26-28 days. Insufficient aeration under the stones is related to the development in embryo respiration, namely: orientation of the eggs by their animal pole upwards, rotatory movement of the egg within its envelope which promotes agitation of perivitelline fluid, development of periblastoic sinus orienting the embryo by its head portion upwards, large content of respiratory carotinoid pigment in the eggs, high development of the respiratory vascular system at the surface of the yolk sac in the embryos. There is a bibliography with 26 references. (Auth.)

8141. Wrobel, Stanisław. (Lab. Water Biol., Polish Acad. Sci., Cracow, Poland). 1962. EFFECT OF FERTILIZATION WITH NITRO-PHOSPHORUS-COMPOUNDS ON THE CHEMICAL COMPOSITION OF WATER, PRIMARY PRODUCTION OF PHYTOPLANKTON AND INCREMENT OF FISH IN PONDS. (WPŁYW NAWOZENIA AZOTOWO-FOSFOROWEGO NA SKŁAD CHEMICZNY WODY, PRODUKCJE PIERWOTNA FITOPLANKTONU I PRZYROSTY RYB W STAWACH). Acta Hydrobiol 4(2): 151-204. Illus. (German summ.); Biological Abstracts, Vol. 46, No. 2, Abst. No. 5185. 1965.

Ammonium sulfate and superphosphate were used as fertilizers in 5 experimental ponds. Fertilization had a direct influence on the concentration of nutritional ingredients of water, and an indirect one, through water plants, on physical and chemical properties of the pond water. The Ca-Mg ratio ranged from 2.7 to 6.5 and depended on concentration of Ca in the ponds. The observed ratio N:P_2O_5 was 2:1; it can be extended to 4:1 (as in plants) by using phosphate fertilizers. The primary production of phytoplankton in the fertilized ponds was twice as high as in the controls with 50 kg N/ha, and three times as high with 70-80 kg. A classification of ponds as to their trophic value was made on the basis of primary production of phytoplankton. Fish production increased from 110 to 250 kg/ha when kg N/ha and 35 kg P_2O_5/ha was used, and to 357-513 kg/ha when 70-85 N/ha was introduced. A suggestion was made that in the study of fish ponds priority should be given to the relationship of the organic world and its abiotic environment rather than to chemical analysis of the water. --Courtesy NSF (PL 83-480) 1963.

8142. Dawe, Clyde, J. (Lab. Pathol., Natl. Cancer Inst., Bethesda, Md.), Mearl F. Stanton, and Frank J. Schwartz. 1964. HEPATIC NEOPLASMS IN NATIVE BOTTOM-FEEDING FISH IN DEEP CREEK LAKE, MARYLAND. Cancer Res., 24(7): 1194-1201. Illus.; Biological Abstracts, Vol. 46, No. 2, Abst. No. 6548. 1965.

Solitary neoplasms of intrahepatic bile duct origin were found in the livers of three of twelve white suckers (Catostomus commersoni) taken from Deep Creek Lake, Maryland. The neoplasms were inhabited by a protozoan parasite which was also found in bile ducts of tumor-free C. commersoni. The tumor-bearing fish were all in the maximal size range of this species in Maryland. No neoplasms were found in the smaller specimens examined. Multiple nodular lesions were found in the liver of one brown bullhead (Ictalurus nebulosus) from the same lake. These lesions were composed of hepatocellular proliferations resembling minimal-deviation hepatomas, but the possibility that they represented nodular regenerations could not be ruled out. Both species involved are native, bottom-feeding fish, never fed hatchery diets of the type currently under investigation in connection with the epizootic of hepatomas in rainbow trout. Environmental factors deserving consideration as possible etiologic influences include: the unidentified protozoan parasite; carcinogenic hydrocarbons from motorboat exhausts; rotenone introduced into the water in fish population studies; and insecticides such as DDT. It is suggested that bottom-feeding fish may prove to be useful as indicators of environmental carcinogens. (Authors)

8143. Trott, J.R., and Ruth Lucow. (Fac. Dentist., Univ. Manitoba, Winnipeg, Manitoba, Canada). 1964. A MACROSCOPIC AND MICROSCOPIC INVESTIGATION OF THE TEETH OF TWO CYCLOSTOMES, PETROMYZON MARINUS AND POLISTOTEMA STOUTII. Acta Anat (Basel), 56(3): 201-215. Illus.; Biological Abstracts, Vol. 46, No. 2, Abst. No. 6230. 1965. (French and German summ.).

Teeth from P. marinus and P. stoutii were examined histologically. Although in both animals the teeth are horny in nature, there are marked differences in their general morphology. The teeth of P. marinus consisted basically of 3 epidermal keratinous cones, while those of P. stoutii consisted of a single deep keratinous cone to which there was a large central core of epithelial cells forming the main body of the tooth. In both animals there was a space between the oral epithelium and the outer keratinous cone, which may be a very early form of "gingival crevice". In P. stoutii the epithelial cells

lying alongside this "crevicular" space were morphologically markedly different from those around the base of the keratin cone. The general morphology of the teeth in P. stoutii may be more advanced phylogenetically than those in P. marinus. It was difficult to determine the manner of tooth succession in P. stoutii. In P. marinus, the whole outer cone was lost at once and a new one formed deep in relation to the 2 remaining keratinous cones. (Authors).

8144. Voinarovich, Elek. 1958. DEVICE FOR THE EXTRACTION OF STOMACH CONTENT OF PREDATORY FISHES (ESOX LUCIUS, STIZOSTEDION LUCIOPERCA, SILURUS GLANIS, AND OTHERS. (PRIBOR DLYA IZVLECHENIYA SODERZHIMOGO ZHELUDKOV KHISHCHNYKH RYB (SUDAK, SHCHUKA, SOME I DRUGIE). Nauchn.-Tekh. Byul. Vses. Nauchn.-Issled. Inst. Ozernogo i Rechnogo Rybn. Khoz 6/7. 108-109; Referat. Zhur., Biol., 1960, No. 25658. (Translation); Biological Abstracts, Vol. 46, No. 2, Abst. No. 4710. 1965.

The device is a kind of pump, with a tube 25 cm long. Its diameter depends on the size of the fish. The stomach contents are evacuated through the mouth and scraped up with a spatula. The device and its parts are drawn. --Courtesy NSF (PL 83-480) 1963.

8145. Anthony, James D. 1963. PARASITES OF EASTERN WISCONSIN FISHES. Trans. Wis. Acad. Sci. Arts. Letter 52: 83-95; Biological Abstracts, Vol. 46, No. 2, Abst. No. 5190. 1965.

In a survey of fish parasites undertaken during the summer of 1960 from 17 lakes and ponds, 324 fishes representing 25 different species were examined. Those infected with at least one species of parasite totaled 300 and represented 93% of the total autopsied. The number of fish infected with each parasite is presented. The most common parasites found were monogenetic trematodes, of the Order Gyrodactyloidea, on the gills, scales and fins of 15 species of fish and Neascus spp. in 11 species of fish. (Auth.)

8146. Cairns, John Jr., and Arthur Scheier. (Acad. Natur. Sci., Philadelphia, Pa.). 1964. THE EFFECT UPON THE PUMPKINSEED SUNFISH LEPOMIS GIBBOSUS (LINN.) OF CHRONIC EXPOSURE TO LETHAL AND SUBLETHAL CONCENTRATIONS OF DIELDRIN. Notulae Natur (Philadelphia) 370. 1-10. Illus.; Biological Abstracts, Vol. 46, No. 2, Abst. No. 5200. 1965.

The acute and chronic response of this fish to Dieldrin was determined in a soft synthetic dilution water at a test temperature of 20° ± 1° C. The median tolerance limits (TLm or LD_{50}) for the acute tests were as follows: 24 hrs., 0.0155 ppm; 48 hrs., 0.012 ppm; 72 hrs., 0.0075 ppm; 96 hrs., 0.0067 ppm. Chronic exposure to 0.00168 ppm for a period of 12 weeks affected the O_2 consumption and the cruising speed ability. (From auth. abst.)

8147. Lindroth, Arne. 1964. INTERNAL TAGGING OF SALMON SMOLTS. III. FINAL REPORT ON TAGGINGS 1952-55 AND COMMENTS ON THE SMOLT PRODUCTION OF A SALMON RIVER. Rept. Inst. Freshwater Res. Drottning Holm. 45: 105-112. Illus.; Biological Abstracts, Vol. 46, No. 2, Abst. No. 5220. 1965.

Internal tags were placed upon almost 20,000 salmon (Salmo salar) smolts in the Swedish river Indalsälven in 1952-55. Turbines at the Hölle power station were shown not to be a significant mortality factor. Returns totaled 1.02-1.38% (95% confidence interval) at sea ages 1-4. The 1953 smolt output is estimated at 300,000, which agrees with estimates based upon smolts per square meter (0.3 smolt per 10 m^2), upon total recruitment to the Baltic, and upon numbers to be stocked. --K. D. Carlander.

8148. Luferov, V. P. 1963. ON THE QUESTION OF UTILIZATION OF SUBMERGED TIMBER EPIBIONTS BY FISH. (K VOPROSU O POTREBLENII RYBAMI EPIBIONTOV ZATOPLENNYKH LESOV). In: Materialy po biologii i gidrologii volzhskikh vodokhranilishch. (Data on the biology and hydrology of the Volga reservoirs). Akad. Nauk SSSR: Moscow - Leningrad. 66-68; Referat. Zhur., Biol., 1963, No. 23I27. (Translation); Biological Abstracts, Vol. 46, No. 2, Abst. No. 5223. 1965.

Experiments were conducted in tanks (1 m^2 in area) into which were placed sawed-off underwater parts of dead trees with a total surface area of 0.15 m^2. Each tank contained 3058 kg (sic) of epibionts per m^2, particularly Bryozoa, as well as tendipedid larvae and caddis flies. Ten starved fish were placed in each tank for 3 days, and the composition of their food as well as the index of fullness of their stomachs determined. Among the fish studied (Abramis brama, aged 3+ to 10+; Blicca bjoerkna, 3+ to 6+; Rutilus rutilus, 3+ to 6+; Leuciscus idus, 2+ to 6+; Perca fluviatilis, 1+ to 7+) only young L. idus utilized epibionts of submerged trees (Bryozoa); the other fishes did not use epibionts to any significant extent.

8149. Monten, Erik. 1964. STUDIES ON FISH MORTALITY DUE TO PASSAGE THROUGH TURBINES. PRELIMINARY REPORT. Rep Inst Freshwater Res Drottningholm 45: 190-195; Biological Abstracts, Vol. 46, No. 2, Abst. No. 5232. 1965.

Fish were introduced into turbines and caught in nets below (8 % were not recaptured). Decreasing the load from full to half in a Francis turbine reduced salmon (Salmo salar) fingerling mortality from 50% to 7.5%. Mechanical injury of salmon parr starts at 2.5 m/sec and of eels (Anguilla sp.) at 3.5 m/sec and increases with increased speed up to 3.2 m/sec for salmon and 5.5 m/sec for eels. Further increase in speed does not increase mortality. Each fish species has its typical pattern of injury, with brain, gill, and fin injury most common. Probability of being hit by a vane edge is determined by the openings between runner vanes, the length of the fish in a direction perpendicular to the vane, and the water current. When the opening corresponds to

the thickness of the fish, 100% are hit. Vulnerable length is about 50-60% of total length. Observed mortality and injury correspond well to theoretical computed values but supporting data will be published later. --K. D. Carlander.

8150. Spanovskaya, V. D. (Moscow State Univ., Moscow, USSR). 1963. FOOD OF PIKE FINGERLINGS (ESOX LUCIUS L.). PITANIE SHCHUKI-SEGOLETKA (ESOX LUCIUS L.). Zool Zhur 42(7): 1071-1079. Illus., (English summ.); Biological Abstracts, Vol. 46, No. 2, Abst. No. 5260. 1965.

Pike fingerlings 40-100 mm long feed mainly on young cyprinids, of the species characterized by great abundance in the biotopes where pike dwell. Peculiarites of the relationships of the young-prey affect the sites and the time of the feeding during 24 hours. Pike yearling of more than 100 mm select larger yearlings of other fishes. In waterbodies with great number of perches, pike yearlings prefer to feed on those latter, in some cases cannibalism is observed. This should be taken into consideration when rearing pike young in ponds. (Auth.)

8151. Wendt, Curt. (Inst. Zoophysiol., Gottenburg, Sweden). 1964. INFLUENCE OF LOW TEMPERATURE ON THE BLOOD LACTATE LEVEL IN SALVELINUS FONTINALIS AFTER EXERCISE. Rep Inst Freshwater Res Drottningholm 45: 206-210; Biological Abstracts, Vol. 46, No. 2, Abst. No. 5267. 1965.

A modified microdiffusion method of blood lactate determination gave similar results to the Barker-Summerson method but with less blood and in less time. Salvelinus fontinalis exercised 15 min at 5°C had low blood lactate levels (13-61 mg%) compared to fish similarly exercised at 15° C (36-166 mg%). -- K. D. Carlander.

8152. Pugh, James E., Jr. 1965. TAKING TEMPERATURES. Field & Stream, 70(2): 92-96.

Discussion of aquathermic fishing and limnological information presented in such a way that the man who pays the bill can understand.

8153. Chance, Ronald E. (Eli Lilly Pharmaceut. Co., Indianapolis, Ind.), Edwin T. Mertz, and John E. Halver. 1964. NUTRITION OF SALMONOID FISHES. XII. ISOLEUCINE, LEUCINE, VALINE AND PHENYLALANINE REQUIREMENTS OF CHINOOK SALMON AND INTERRELATIONS BETWEEN ISOLEUCINE AND LEUCINE FOR GROWTH. Jour. Nutrition, 83(3): 177-185. Illus.

Growth studies were conducted with chinook salmon fingerlings (Oncorhynchus tshawytscha) to determine the minimal requirements for isoleucine, leucine, valine and phenylalanine. A 41% protein diet containing an indispensable amino acid pattern similar to that found in whole egg protein was used as the experimental diet. Based on the dry diet, the salmon required about 1.6% of leucine, 1.3% of valine and 2.1% of phenylalanine (0.4% supplied by tyrosine). The isoleucine requirement appeared to be influenced by dietary leucine level, being about 0.9% with 1.50% of leucine, about 1.0% with 3.68% of leucine and about 1.1% with 6.00% of leucine. On the other hand, excess dietary isoleucine reduced growth rates when fed in conjunction with a slightly suboptimal level of leucine. Growth of the salmon fingerlings was reduced slightly below the control diet when 1.0% of isoleucine and 1.25% of leucine were fed; however, 3.00 and 5.0% levels of isoleucine with 1.25% leucine reduced growth to 67 and 60% of the control, respectively, presumably by increasing the leucine requirement similar to the way excessive leucine increases the isoleucine requirement. (Authors)

8154. Weiss, C. M., and J. H. Gakstatter. (Univ. N. C., Chapel Hill, N. C.). 1964. DETECTION OF PESTICIDES IN WATER BY BIOCHEMICAL ASSAY. Jour. Water Pollut. Contrl. Federation 36(2): 240-253; Biological Abstracts, Vol. 46, No. 2, Abst. No. 8773. 1965.

Biochemical assay techniques were developed suitable for detecting concentrations of organic phosphorus pesticides as low as 10^{-4} mg/l in water. The procedure was based on measurement of acetylcholinesterase inhibition in brain-tissue of bluegill sunfish exposed to test solutions for prolonged periods. --I. Gellman.

8155. Abrosov, V. N. 1959. IMPORTANCE OF CHARA BEDS IN THE LIFE OF LAKES. (O ZNACHENII ZAROSLEI KHAROVYKH VODOROSLEI (CHARALES) V ZHIZNI OZER). Bot. Zhur. 44(5): 684-687; Referat. Zhur., Biol., 1960, No. 38873. (Translation); Biological Abstracts, Vol. 46, No. 3, Abst. No. 9668. 1965.

A vigorous development of Chara induces an alkalitrophic type of lake development. According to observations in March these algae photosynthesize under ice and improve the O_2 conditions of the lakes. The normal development of ova and the great number of young whitefish prove that the Chara does not excrete any toxic substances inhibiting the growth of fish. It is recommended to plant Chara in lakes of the coregonoid type to establish shelters for the larvae. --Courtesy NSF (PL 83-480) 1963.

8156. Dooley, Thomas P., and Jafus Cavil. (Prairie View Agric. and Mech. Coll., Prairie View, Texas). 1964. MINIMUM LETHAL CONCENTRATION OF 15 COMMON DETERGENTS ON THE MOSQUITO MINNOW (GAMBUSIA AFFINIS). Texas Jour. Sci., 16(2): 202-209; Biological Abstracts, Vol. 46, No. 3, Abst. No. 9683. 1965.

The minimum lethal concentration varied from 0.020% to 0.00125%. The concentration in which fish lived for more than 72 hours was considered as the survival concentration. The initial concentration for each detergent was 1%. The pH of different detergents at the 1% concentration varied from 9.5 to 6.4 and in each instance fish were killed. The pH decreased as dilutions were made until a constancy in pH was reached where further dilutions did not affect the pH. The survival time of the fish increased with the increase in dilutions until there was no lethal effect. It is believed that lethality is

not due primarily to pH, but is due to the concentration of surfactant which is reduced with dilutions. (Authors)

8157. Lukashov, V.N., and V.V. Usachev. 1963. THE BEHAVIOR OF ROACH, BREAM AND ZANDER IN AN ELECTRIC FIELD. (POVEDENIE VOBLY, LESHA I SUDAKA V ELEKTRICHESKOM POLE). Tr Kaspiiskogo Nauch-Issled Inst Morskogo Rybn Khoz Okeanogr 19. 3-10. From: Ref Zh Biol, 1964, No. 3I49. (Translation); Biological Abstracts, Vol. 46, No. 3, Abst. No. 9719. 1965.

Laboratory experiments were carried out to determine the reactions of fishes to direct, interrupted (3 breaks per second with 2 gaps) and alternating currents. The voltage required to induce electrotaxis and electronarcosis was determined for roach (Rutilus rutilus), bream (Abramis brama) and zander (Stizostedion lucioperca). The voltage required for electronarcosis was found to be 1.4 times greater than that for electrotaxis, but the voltage required to produce a specific reaction varied with fish size. Current sensitivity was lower in summer than in fall and winter, a fact which is correlated with the temperature of the water. Sex and fat content did not affect the condition of the fish in an electric field. In order to study the alarm effect of an electric current, a non-uniform electric field was established in an aquarium. Electrofishing equipment for the capture of migratory and downstream-migrating fish in the river was tested. An apparatus was assembled according to the method of the Commission for the Electrification of Rural Districts. Catches by electrofishing were higher and the fish larger. Diagrams of hook-ups used in laboratory experiments and in river-electrofishing gear are presented.

8158. Nikiforov, N.D. 1958. INTRODUCTION OF PINK SALMON (ONCORHYNCHUS GORBUSCHA WALB.) INTO THE BARENTS SEA BASIN. (INTRODUKTSIYA GORBUSHI V BASSEIN BARENTSOVA MORYA). Nauchn. Tekh. Byul. Vses. Nauchn.-Issled. Inst. Ozernogo Rechnogo Rybn. Khoz. 6/7. 110-111; Referat. Zhur., Biol., 1960, No. 6525. (Translation); Biological Abstracts, Vol. 46, No. 3, Abst. No. 9732. 1965.

In October 1956, fertilized eggs of pink salmon were sent from Sakhalin to Murmansk. After a period of growth in the Taibol'skii fish factory the larvae were released into the Kola River in June 1957. The weight of released larvae was 200 mg and their length was 3.3 cm each. After 15-20 days shoals of fry started the downstream migration to the sea. --Courtesy NSF (PL 83-480) 1963.

8159. Phillips, Robert W., and Homer J. Campbell. (Oregon State Univ., Corvallis, Oreg.). 1962. THE EMBRYONIC SURVIVAL OF COHO SALMON AND STEELHEAD TROUT AS INFLUENCED BY SOME ENVIRONMENTAL CONDITIONS IN GRAVEL BEDS. Pacific Mar. Fish. Comm. Ann. Rept. 1961. 14: 60-73. Illus.; Biological Abstracts, Vol. 46, No. 3, Abst. No. 9739. 1965.

Under the assumptions listed, the following conclusions are: (1) that there is a positive correlation between the survival of coho and steelhead embryos and mean dissolved O_2 concentration in the gravel beds of two small coastal streams; (2) that the dissolved O_2 concentration necessary for the embryonic survival of coho and steelhead in coastal stream gravel beds is greater than has been previously suspected. Results of field experiments indicate that mean O_2 concentrations in gravel necessary for a high survival of coho and steelhead embryos may exceed 8 mg/liter. (Authors)

8160. Privol'nev, T.I. (State Res. Inst. Lake and River Fish. Indust., Leningrad, USSR). 1963. OXYGEN CONCENTRATION THRESHOLDS FOR FISH IN WATER OF DIFFERENT TEMPERATURES. (POROGOVAYA KONTSENTRATSIYA KISLORODA V VODE DLYA RYB PRI RAZNYKH TEMPERATURAKH). Dokl Akad Nauk SSSR 151(2): 439-440. Illus.; Biological Abstracts, Vol. 46, No. 3, Abst. No. 9744. 1965.

The following oxygen lethal thresholds were found at the temperatures shown: Salmo salar fingerling, 15° C, 1.51 ml/liter, 25° 2.85; yearling, 16° 1.89, 25° 2.78; Oncorhynchus keta fingerling, 17° 1.99, 25° 3.36; O. gorbuscha fingerling, 17° 2.13, 25° 4.35; Perca fluviatilis, 15° 0.4, 25° 1.4; Rutilus rutilus, 15° 0.6, 23° 1.6; Esox lucius, 15° 0.72, 29° 1.40. It is emphasized that these are thresholds at which death occurs; inhibition of respiration and other vital activities begins at higher O_2 concentrations. Above the temperature range (up to about 20°) for which fishes have established adaptation, the threshold concentration rises steeply. (From auth. summ. transl.)

8161. Rudakov, N.P. 1958. MARKING FISH WITH RADIOACTIVE CERIUM (Ce^{144}+Pr^{144}). (MECHENIE RYB RADIOAKTIVNYM TSERIEM (Ce^{144}+Pr^{144})). Rybn, Khoz. 9. 29-31; Referat. Zhur., Biol., 1959, No. 53891. (Translation); Biological Abstracts, Vol. 46, No. 3, Abst. No. 9748. 1965.

Experiments in marking fish with radioactive isotopes of the gamma emitter are described. Fingerling carp weighing 15 g were kept in a Ce^{144} solution (1 μc/l) for one hour. Fish rapidly absorb radiocerium from water. During the first days after marking, Ce^{144} accumulated in the liver. After one month it concentrated in the bones, thus making its preservation possible in the organism for a long time. With the aid of a β - radiometer, marked and unmarked fish could easily be detected at a distance of 10-15 cm from the counter after 1-1/2 months in running water. This method facilitates the detection of marked fish. Examination of individual fish is unnecessary. --Courtesy NSF (PL 83-480) 1963.

8162. Stroganov, N.S. 1963. FOOD PREFERENCES OF THE GRASS CARP. (IZBIRATEL'NAYA SPOSOBNOST' AMUROV K PISHCHE). In: Materialy Vsesoyuznogo soveshchaniya po rybokhozyaistvennomu osvoeniyu rastitel'noyadnykh ryb—belogo amura i tolstolobika—v vodoemakh SSSR, 1961. (Data on the All-Union conference on the cultivation of the herbivores

Ctenopharyngodon idella and Hypophthalmichthys molitrix in Russian waters). Akad Nauk Turkm SSR Ashkhabad 181-191. From: Ref Zh Biol, 1964, No. 3I32. (Translation); Biological Abstracts, Vol. 46, No. 3, Abst. No. 9759. 1965.

Experiments were conducted in ponds of the Moscow oblast' during the combined cultivation of grass carp with sturgeons. The food was placed on a wooden frame divided by strips into 4-6 sections. The feeding rate was estimated from the amount of food supplied and the amount remaining. During the period of investigation, 1954 to 1961, more than 70 species of plants were used. The plants were divided into 4 groups according to the rate of their utilization: highly utilized, moderately utilized, poorly utilized and not utilized (a description of the plants is given). Grass carp feed mainly during quiet weather, and more intensively at temperatures above 16° C. In colder water they utilize a significantly smaller amount of food, and at 3-6° C it feeds at intervals of from 5 to 7 days. Food selectivity decreases (wide nutrition spectrum) at higher temperatures and increases at lower temperatures (narrow nutrition spectrum). Grass carp prefer soft vegetation and readily consume bread and oats. During the growing period, young grass carp in ponds utilize terrestrial plants up to 8 kg per kilogram of their own weight. The food coefficient averages 18 (from 14 to 21), increasing with a deficiency of preferred foods to 54. The fish tear the plant food into 1-3-mm pieces (sometimes 5-10 mm). The digestion of plants is 60-70%.

8163. Walker, Charles R. (Fish Contr. Lab., Bur. Sport Fish. & Wildlife, LaCrosse, Wis.). 1964. DICHLOBENIL (2, 6-DICHLORO-BENZONITRILE) AS A HERBICIDE IN FISH HABITATS. Weeds, 12(4): 267-269. Illus.; Biological Abstracts, Vol. 46, No. 3, Abst. No. 9771. 1965.

Application of 20 to 40 lb/A dichlobenil made prior to emergence accomplished various degrees of control of pondweeds (Potamogeton diversifolius, P. foliosus, P. pectinatus, P. pusillus) and a slender naiad (Najas flexilis). Coontail (Ceratophyllum demersum) was affected only by the higher dosage. Limited control and growth inhibition was achieved on several forms of algae in early spring applications. However, applications made to rooted submersed aquatic plants and filamentous algae (Cladophora, Pithophora and Chara) at postemergence stage of development had little herbicidal effect. Dichlobenil was not acutely toxic to fish at herbicidal concentrations. The range of median tolerance limits was 10 to 20 ppmw for pumpkinseed (Lepomis gibbosus), bluegill (L. macrochirus), redear sunfish (L. microlophus), and largemouth bass (Micropterus salmoides). (Auth.)

8164. Zarnecki, Stanisław. (Sch. Agric., Cracow, Poland). 1963. DIFFERENTIATION OF ATLANTIC SALMON (SALMO SALAR L.) AND SEA TROUT (SALMO TRUTTA L.) OF THE VISTULA RIVER INTO SEASONAL POPULATIONS. (WYSTEPOWANIE POPULACJI SEZONOWYCH U LOSOSIA ATLANTYCKIEGO (SALMO SALAR L.) ORAZ U TROCI (SALMO TRUTTA L.) W RZECE WISLE. Acta Hydrobiol 5(2/3): 255-294. Illus. (English summ.); Biological Abstracts, Vol. 46, No. 3, Abst. No. 9775. 1965.

An attempt is made to distinguish the "vernal" population from the "hiemal" population in terms of Berg's definitions. In addition to hiemal populations, vernal populations of both spp. were found in the material gathered in 1950-1951. Two groups were defined: those with undeveloped gonads (hiemal type), and those with more or less developed gonads (the vernal type). Thus the vernal populations among the fish entering the river in the autumn could be distinguished. Vernal specimens of both spp. differed chiefly in the advanced development of the gonads. The morphological differences between the hiemal and vernal populations were rather imperceptible. No intermediate stages between type were found either in salmon or sea trout. It is supposed that the vernal populations spawn the same year they enter the river, in the affluents of the lower Vistula near the sea. The heimal populations remain in the river for a full year; the following spring and summer they migrate up the river and spawn in the affluents of the upper Vistula in the autumn. The spawners of the 2 seasonal populations do not intermix since there is a distance of about 100 km between their spawning grounds. Hence, the hypothesis that the seasonal populations described represent 2 separate races seems probable. The age and growth of the seasonal populations are also analyzed. --Courtesy NSF (PL 83-480) 1964.

8165. Zolotov, G.N. 1963. OBSERVATIONS ON REACTIONS OF YOUNG FISH TO A MOVING ELECTRIC FIELD. (K IZUCHENIYU REAKTSII MOLODI RYB V ZONE DEISTVIYA DVIZHUSHCHEGOSYA ELEKTRICHESKOGO POLYA). Tr Inst Ikhtiol Rybn Khoz Akad Nauk Kazakhsk SSR 4: 175-186.; Referat Zhur, Biol., 1963, No. 22I57. (Translation); Biological Abstracts, Vol. 46, No. 3, Abst. No. 9778. 1965.

The response of fish to a moving electric field, produced by a continuous alternating current, was studied in the slow-moving water of the Lake Aspa inlet channel. Composition and number of fish in the lake were estimated before and after experimentation. The fish were driven from the channel in 2 steps, the electrodes being moved by hand (at 0.5 km/hr), toward the lake. The quantity of fish driven into the lake was, on the average, 81.7% (429 specimens) by number and 91.7% (2.83 kg) by weight. This method is recommended for rescuing fish from constricted bodies of water and for directing them toward the outlets of partially drainable ponds.

8166. Valdez, I.E., and D.A. Conroy (Univ. Nac. Buenos Aires, Inst. Biol. Mar., Buenos Aires, Argentina). 1963. THE STUDY OF A TUBERCULOSIS-LIKE CONDITION IN NEON TETRAS (HYPHESSOBRYCON INNESI). II. CHARACTERISTICS OF THE BACTERIUM ISOLATED. Microbiol Espan 16(4): 249-253. Illus.; (Spanish summ.); Biological Abstracts, Vol. 46, No. 3, Abst. No. 11943. 1965.

A disease in neon tetras resembling piscine tuberculosis, caused by an acid-fast organism, was reported. The organism, designated as M/A-1, was tentatively classified as Mycobacterium species indeterminata. A comprehensive study of the isolate indicated that it is a strain of Nocardia asteroides. This is the first report of this organism as a pathogen of fish, although subsequent reports have associated it with diseased trout. --B.Q. Ward.

8167. Templeton, W.L., and V.M. Brown. (U.K. At. Energy Authority, Windscale Works, Cumberland, England). 1964. THE RELATIONSHIP BETWEEN THE CONCENTRATIONS OF CALCIUM, STRONTIUM AND STRONTIUM-90 IN WILD BROWN TROUT, SALMO TRUTTA L. AND THE CONCENTRATIONS OF THE STABLE ELEMENTS IN SOME WATERS OF THE UNITED KINGDOM, AND THE IMPLICATIONS IN RADIOLOGICAL HEALTH STUDIES. Air Water Pollut 8(1): 49-75. Illus. Map; Biological Abstracts, Vol. 46, No. 4, Abst. No. 14079. 1965.

The concentrations of calcium and strontium were measured in 20 surface fresh waters from the United Kingdom, and relationships derived for the concentration of strontium and the ratio of atoms of strontium per 1000 atoms of calcium as a function of the calcium concentration of the water. Brown trout (Salmo trutta L.) and some other species of fresh-water fish were sampled from some of these waters and the calcium and strontium concentrations measured in bone, muscle tissue and whole fish. The calcium concentration in bone and muscle tissue of brown trout was independent of the calcium concentration of the water, while the strontium concentration of the tissues was inversely related to the strontium concentration and hence, the calcium concentration of the water. In both bone and muscle tissue discrimination against strontium, relative to calcium, occurs. The Sr/Ca atom ratio in fish and plants reflects the Sr/Ca atom ratio of the water. The accumulation factors for strontium in brown trout ranged from 3.2×10^4 in bone and 80.0 in muscle tissue in waters of low calcium concentration, to 280 in bone and 1.0 in muscle tissue in waters of high calcium concentration. Predicted values of the concentration of Sr^{90} in brown trout muscle tissue, at true equilibrium, and reflecting the contribution from both water and diet, in waters containing calcium in the range 0.36 to 100 mg Ca/l. and Sr^{90} in the range 1·0-100·0 μ μc Sr^{90}/l. are presented. Radiological health implications are discussed. (Authors)

8168. Threinen, C.W., and Ronald Poff. 1963. THE GEOGRAPHY OF WISCONSIN'S TROUT STREAMS. Trans. Wis. Acad. Sci. Arts Letter 52. 57-75. Illus. Map.; Biological Abstracts, Vol. 46, No. 4, Abst. No. 14362. 1965.

Trout streams in Wisconsin have been located on a hydrographic map of the state. In this manner the geography leading to the existence of the streams can be seen. Since the trout require cold waters in summer and warm waters in winter, they are dependent upon ground water for these conditions. Trout streams occur abundantly in regions with good slope that provide a hydraulic gradient for ground water, in regions that have permeable sandy soils which permit ready infiltration and lateral movement of ground water. Trout streams are lacking in regions of little slope and clay soil types, and in regions containing abundant lakes. Impoundment of trout streams is regarded as the greatest threat to the maintenance of trout waters. (Authors)

8169. Gunter, Gordon (Gulf Coast Res. Lab., Ocean Springs, Miss.), and Gordon E. Hall. 1963. BIOLOGICAL INVESTIGATIONS OF THE DISCHARGES THROUGH THE ST. LUCIE CANAL. Gulf Res Repts 1(5): 189-307. Illus. Maps; Biological Abstracts, Vol. 46, No. 3, Abst. No. 9700. 1965.

Studies were conducted to sample fish populations in the St. Lucie Estuary. Although the salinity of the water was generally low there was a predominance of marine species. Eighty-three species of fish, 64 of them marine, were taken. Five marine species made up 89% of the catch. The largest catches of fish coincided with the release of freshwater into the estuary. Production and fertility of the area are increased by outflows of freshwater. Many of the sport fishes remained in the area even when salinities were quite low.

8170. Killick, S.R., and W.A. Clemens. (Internal. Pacific Salmon Fish. Comm., New Westminister, Brit., Columbia, Canada). 1963. THE AGE, SEX RATIO AND SIZE OF FRASER RIVER SOCKEYE SALMON 1915-1960. Bull. Internatl. Pacific Salmon Fish. Comm. 14. 1-139. Illus. Map; Biological Abstracts, Vol. 46, No. 4, Abst. No. 14391. 1965.

A total of 88,368 samples have been taken from the commercial catches to provide a continuous record of the annual age composition, sex ratio and size (weight and length) of Fraser River sockeye salmon (Oncorhynchus nerka) from 1915 to 1960. Four age classes, 3_2, 4_2, 5_2, and 5_3, were found to be consistently present and represented by percentages of 2.20, 89.25, 6.94 and 1.61 respectively. The 4_2 fish constitute the dominate age class. The upper Fraser sockeye are largely 4-year-old fish while 5-year-old fish are relatively more numerous in the lower Fraser area. The management of the Fraser River sockeye fishery may be based almost entirely on the 4_2 age class. The sex ratio is slightly in favor of the females (47:53). The sex ratio of the 3_2 "jack" sockeye was greatly in favor of males (94:6); thus, this age class was not considered to be a self-perpetuating stock. The size of Fraser sockeye has varied considerably from a low of 5.05 pounds to a high of 7.21 pounds for 4-year-old fish. Variations in annual sizes were attributed to basic differences in the genetic size characteristics of different races and to changes in growth conditions in the marine environment. The annual sockeye size variations greatly affected the size of the annual commercial packs. Selective

fishing by gill nets was examined and no evidence was found to indicate that selection of either large or small sockeye had any permanent effects on the size of Fraser River sockeye. Predicting sockeye sizes in advance of each fishing season can be done with only limited accuracy until the first fish are caught in any season. (Authors)

8171. Woodall, A. N., L. M. Ashley, John E. Halver (Western Fish Nutr. Lab., Cook, Wash.), H. S. Olcott, and John Vander Veen. 1964. NUTRITION OF SALMONOID FISHES. XIII. THE α-TOCOPHEROL REQUIREMENT OF CHINOOK SALMON. Jour. Nutrition 84(2): 125-135. Illus.

Tocopherol-deficient diets containing 1 or 5% of stripped herring oil were supplemented with zero, 10, 20, 40 and 80 mg of α-tocopherol/100 g of dry diet and were fed to duplicate lots of chinook salmon (Oncorhynchus tshawytscha) fingerlings for 24 weeks. Separate lots of fish were fed diets containing 1% of trilinolein and supplemented with 10, 20, 40 and 80 mg of tocopherol/100 g of dry diet. In a second feeding trial the diet containing 5% of herring oil was supplemented with 2.5, 5.0, 10, 20 and 40 mg of tocopherol/100 g of dry diet and was fed to duplicate lots of fish. The deficiency syndrome included: poor growth; exophthalmia; ascites; erythrocyte fragility; anemia; clubbed gills; epicarditis and ceroid deposition in the spleen. The symptoms were more severe in the fish fed the unsupplemented diet containing 5% of herring oil than they were in the fish fed the 1% herring oil diet and were not observed in fish fed diets supplemented with tocopherol. Under the experimental conditions used, a requirement of less than 3 mg of α-tocopherol/100 g dry diet was indicated. The herring oil used in diet preparation contributed 0.5 mg of tocopherol/100 g of dry diet (0.1 mg/g oil). (Authors)

8172. McDaniel, James S. (Dept. Zool., Univ. Okla., Norman, Okla.). 1963. PARASITES FROM THE GENUS LEPOMIS (CENTRARCHIDAE) IN LAKE TEXOMA, OKLAHOMA. Trans. Amer. Microscop. Soc. 82(4): 423-425; Biological Abstracts, Vol. 46, No. 4, Abst. No. 17933. 1965.

The helminth and copepod parasites of 4 species of sunfishes common to the Buncombe Creek Arm of Lake Texoma were studied. The hosts are Lepomis macrochirus, L. humilis, L. cyanellus, and L. megalotis. Of 259 fish autopsied, 257 (99.2%) harbored at least one species of parasite. Individual parasite loads were commonly light. Incidences of parasites were low for those dependent upon invertebrates as intermediate hosts. This is correlated with the paucity of these hosts in the habitats involved. Total parasitism exhibited little change seasonally or in relation to locality of host collection. Seasonal fluctuation was observed in Bothriocephalus claviceps, which was taken only during the late spring. (Auth.)

8173. Mansueti, Alice Jane. (Chesapeake Biol. Lab., Solomons, Maryland). 1964. SPAWNING OF THE COBIA, RACHYCENTRON CANADUM, IN THE CHESAPEAKE BAY AREA, WITH OBSERVATIONS OF JUVENILE SPECIMENS. Chesapeake Science, 5(1/2): 67-71. Illus.; Biological Abstracts, Vol. 46, No. 4, Abst. No. 18251. 1965.

Pelagic eggs collected in Atlantic coastal waters adjacent to Chesapeake Bay have been identified as those of the cobia, Rachycentron canadum (Linnaeus). The egg diameters ranged from 1.16 mm to 1.42 mm with a mean of 1.27 mm. The single large oil globule had a mean diameter of 0.38 mm. The presence of gravid females and the appearance of cobia eggs in plankton collections indicated that spawning occurs between mid-June and mid-August. Sampling in 1960 showed spawning maxima to be in June and July. Although virtually all of the cobia eggs were collected in the Atlantic, knowledge of the current patterns in the survey area led to the conclusion that spawning occurred in lower Chesapeake Bay or in the immediate vicinity of the Virginia Capes. The color pattern and fin shape is described and illustrated from 2 juvenile cobia collected in August 1962. Observations made before capture of the juveniles point out that certain adult behavioral characteristics are already well established in the 1st few months of juvenile existence. (Auth.)

8174. Holz, J., and Ong Bie Hwa. (Inst. Parasitol. Padjadjaran Univ., Bandung, Indonesia). 1963. INFLUENCE OF THE MOLLUSCICIDE BAYLUSCIDE ON PLANKTON OF INDONESIAN FISH PONDS AND RICE FIELDS. Pflanzenschutz Nachr Bayer 16(5): 253-257.; Biological Abstracts, Vol. 46, No. 4, Abst. No. 16875. 1965.

The effect of "Bayluscide" on fish, zoo- and phytoplankton was studied in natural environments as well as in beakers and aquaria. The molluscicide had little effect on warm-blooded organisms, including man. Fish tolerate about 3 times the doses lethal for snails. Zoo- and phytoplankton decreased after treatment but quickly regenerated. --G. B. Orlob.

8175. Abel, Erich. (Zool. Inst., Univ. Wien, Vienna, Austria). 1963. THE AMOUNT OF ENVIRONMENTAL SPACE AS A PSYCHOLOGICAL FACTOR IN FISH BEHAVIOR. (DIE RAUMENGE ALS PSYCHISCHER FAKTOR BEI FISCHEN). In: 1er Congres International d'Aquariologie. (1st International Congress of Aquariology). Monaco 1960. Vol. D. Bull Inst Oceanog Monaco ID. 71-78. Illus. (French and English summ.); Biological Abstracts, Vol. 46, No. 5, Abst. No. 18892. 1965.

The different structures of the substratum that decrease a marine living space (sand, mud, rock, coral reef, plants, etc.) can, according to the ecological relationship of the fishes with the substratum (e. g. whether open sea, coastal, suprademersal or demersal fishes) play a very different part in each case, ranging from a lethal factor (e. g., herrings, sharks) to that of a hiding place surrounding the body ("haptic cavities"). Depending on the specific ecological environment of each species the space conditions which are unsuitable to the species affect the behavior of the fish and modify it (e. g. learning by experience, loss of certain types of behavior, aggressiveness,

"neurosis", etc.). The fish always behaves "normally", that is to say, conformably to any one set of circumstances. (Auth.)

8176. Lapin, Yu. E. 1963. AGE AND POPULATION DYNAMICS OF ONCORHYNCHUS GORBUSCHA. (VOZRAST I DINAMIKA CHISLENNOSTI TIKHOOKEANSKOI GORBUSHI). Byul Mosk Obshch Ispytat Prirody Otd Biol 68(5): 126-127; Biological Abstracts Vol. 46, No. 5, Abst. No. 18952. 1965.

The author disputes existing concepts of the so-called even and odd year generations. He maintains that factual data indicate that a majority of this species mature in 2 years, but a considerable minority in 3 years, varying between years and between rivers. Factors affecting domination of one over the other are discussed. -- B. Le Bental.

8177. Tarr, H. L. A. (Fish. Res. Board Can., Technol. Res. Lab., Vancouver, Brit. Columbia, Canada). 1964. FORMATION OF PURINE AND PYRIMIDINE NUCLEOSIDES, DEOXYNUCLEOSIDES, AND THE CORRESPONDING MONONUCLEOTIDES BY SALMON MILT EXTRACT NEUCLEOSIDE PHOSPHORYLASE AND NUCLEOSIDE KINASE ENZYMES. Can Jour. Biochem. 42(11): 1535-1545; Biological Abstracts, Vol. 46, No. 5, Abstract No. 19047. 1965.

A cell-free extract of immature Salmo gairdneri milts possessed both nucleoside and deoxynucleoside phosphorylase activities. Formation of guanosine, deoxyguanosine, uridine, deoxyuridine, thymidine, thymine riboside, inosine, and deoxycytidine from the corresponding purine or pyrimidine bases was very marked, and the formation of deoxyinosine and cytidine generally was less pronounced, under the experimental conditions. The extract also possessed nucleoside phosphokinase and deoxynucleoside phosphokinase activities, although these were considerably less marked than the former. Formation of the mononucleotides of adenosine, uridine, thymidine, deoxyuridine, guanosine, inosine, and deoxyinosine in the presence of adenosinetriphosphate was recorded. When orotic acid was employed as enzyme substrate, uridine, deoxyuridine, and uridylic acid were formed. Comparatively feeble formation of cytidylic and deoxycytidylic acids from the corresponding nucleosides was found. The possible significance of these findings, in relation to known routes of biosynthesis of mononucleotides, is discussed. (Auth.)

8178. Swift, D. R. (Freshwater Biol. Assoc., Ambleside, Westmoreland, England). 1964. THE EFFECT OF TEMPERATURE AND OXYGEN ON THE GROWTH RATE OF THE WINDERMERE CHAR (SALVELINUS ALPINUS WILLUGHBII). Comp. Biochem Physiol 12(2): 179-183. Illus.; Biological Abstracts, Vol. 46, No. 5, Abstract No. 19287. 1965.

The optimum temperature for growth of Windermere char living in a constant environment is between 12° and 16° C. At water temperatures above and below this range the growth rate is reduced. The oxygen concentration in the water between the values of 50-200 percent of the air saturation concentration has no apparent effect on the growth rate of the fish. (Auth.)

8179. Humm, Douglas G., and Jane H. Humm. (Dept. Zool., Univ. N. C., Chapel Hill, N. C.). 1963. AEROBIC AND ANAEROBIC CARBOHYDRATE UTILIZATION IN NORMAL AND MELANOTIC FISH PIGMENT CELLS (TUMOR CELLS). In: The pigment cell: Molecular, biological and clinical aspects, New York City, 1961. Ann New York Acad Sci 100(2): 857-865; Biological Abstracts, Vol. 46, No. 5, Abst. No. 20645. 1965.

The present study was undertaken to make a comparison between normal fish pigment cells and a very closely related melanoma cell with respect to aerobic and anaerobic glycolysis. The two groups of cells conformed to the now well established pattern in that the tumor cells showed an enhanced aerobic and anaerobic glycolysis. As a first step in the analysis of the differences existing in the normal and tumor glycolytic pathway, the activity of lactic acid dehydrogenase was measured in tumor and normal pigment cells. This dehydrogenase is more active in the tumor. This observation may be sufficient to account for the difference in the two types of cells with respect to glycolysis. (Auth.)

8180. Meshcheryakova, A. I., and Zh. A. Chernyaev. 1963. OXYGEN CONSUMPTION IN EGGS OF THE BAIKAL WHITEFISH COREGONUS AUTUMNALIS MIGRATORIUS (GEORGU) DURING EMBRYOLOGICAL DEVELOPMENT. (POTREBLENIE KISLORODA IKROI BAIKAL'SKOGO OMULYA COREGONUS AUTUMNALIS MIGRATORIUS (GEORGU) V PROTSESSE EMBRIONAL'NOGO RAVITIYA). Vop Ikhtiol 3(4): 669-674; Biological Abstracts, Vol. 46, No. 5, Abst. No. 20879. 1965.

Respiration in the developing omul egg is carried out by 3 sets of structures: (1) simple diffusion through vitelline membrane (2) carotenoid pigment, and (3) yolk-sac vascular system. When fertilized eggs were placed in open containers supplied with running water and, thereby, with a near constant oxygen supply, O_2-consumption gradually increased from time zero to hatching, with significant jumps occurring at gastrulation, first embryonic movement (active), circulatory functioning and larval emergence. When eggs were placed in "closed" vessels, there was a net decrease in O_2-consumption for all stages. Eggs in the later stages were very sensitive to decreases in motion of the bathing fluid (provided by electric stirrers) and died easily when such motion was not provided. Lethal O_2-tensions for the eye-pigmentation and blood-circulation stages were 1.13 and 1.44 mg/l respectively. Observed low levels of respiratory activity and the orange color of the carotenoid pigment associated with it, are most likely adaptive responses to waters with low oxygen tension. --L. T. Penny.

8181. Grande, Magne. (Norwegian Inst. Water Res., Blindern, Norway). 1964. WATER POLLUTION STUDIES IN THE RIVER OTRA, NORWAY.

EFFECTS OF PULP AND PAPER MILL WASTES ON FISH. Air Water Pollut 8(1): 77-88. Illus. Map; Biological Abstracts, Vol. 46, No. 5, Abst. No. 21627. 1965.

Owing to a serious decline in the catch of salmon and trout, chemical and biological investigations were made in the River Otra in southern Norway. The river is polluted from a sulfite pulp and paper mill and a wallboard factory. Chemical investigations demonstrated that the river water upstream from the factories was of oligotrophic character with a pH ranging from 5.5 - 6.1. The low pH values in the water are mostly due to the acid nature of the minerals in the catchment area (granite, gneiss, etc.). Downstream from the factories there was a remarkable increase in the hydrogen ion concentration and electrolytical conductivity. Biological investigations showed that the fungus Fusarium aquaeductuum was the dominating organism downstream from the pulp mill. Chironomidae larvae belonging to the group Orthocladiinae were the dominant invertebrates. Only a few salmon and trout were found in the lower part of the river. Polluted river water was pumped into plastic troughs in which trout (Salmo trutta L.) were studied under controlled conditions. It was found that trout yearling died within a few days, owing to a toxic effect of the river water. Aquaria experiments indicated that the toxic effect was mainly due to the sulfite waste liquor (SWL) discharged from the pulp mill. It was found that at a concentration of about 500 ppm SWL (12-14% solids) in river water, 100% mortality of yearling trout occurred within 9 days. The toxic effect of SWL was found to be accentuated by the low pH value in the receiving water. (Auth.)

8182. Fishelson, L. (Dept. Zool., Univ. Tel-Aviv, Tel-Aviv, Israel), and W. Heinrich. 1963 [1964]. SOME OBSERVATIONS ON THE MOUTHBREEDING TILAPIA GALILAEA L. (PISCES: CICHLIDAE). Ann Mag Nat Hist 7(68): 507-508; Biological Abstracts, Vol. 46, No. 5, Abst. No. 22802. 1965.

In T. galilaea in Israel, both sexes participate in mouthbreeding. The eggs remain in the spawning pit until the whole process of spawning has been finished. The eggs have adhesive fibers by which they adhere among themselves and to the bottom, but they are less adhesive than the eggs of substrate breeders and so can be picked up by the fish without difficulty. Within the mouth cavity the connection between the eggs is loosened. Out of 15 spawnings observed, the female only took the eggs in 3 cases, the male only in 4 cases, and both sexes in 8 cases. In 11 cases it was observed that the eggs were kept in the mouth until the fry were completely developed which on the average takes about 15 days. After the offspring are released, they usually keep together in a school. -- A.K. Winner.

8183. Springer, Victor G. (U.S. Nat. Mus., Washington, Dist. Columbia). 1964. A REVISION OF THE CARCHARHINID SHARK GENERA SCOLIODON, LOXODON, AND RHIZOPRIONODON. Proc U.S. Nat. Museum 115(3493): 559-632; Biological Abstracts, Vol. 46, No. 5, Abst. No. 22822. 1965.

The following spp., all primarily tropical, are recognized: Scoliodon laticaudus (India to Japan), Loxodon macrorhinus (Indo-Pacific, exclusive of Oceania), Rhizoprionodon acutus (Eastern Atlantic and Indo-Pacific exclusive of Oceania), R. terraenovae (Atlantic Coast of United States and Mexico), R. porosus (Western Atlantic exclusive of United States and Mexico), R. longurio (eastern Pacific), R. lalandei (Atlantic, Panama to Brazil), R. oligolinx (Indo-Pacific exclusive of Australia and Oceania), R. taylori (Northern and eastern Australia). Rhizoprionodon is comprised of 2 subgenera, the nominal one and Protozygaena. A key is presented to the genera and spp. and illustrations of all the spp. except R. terraenovae are given. This sp. is a cognate of R. porosus and differs from it only in numbers of precaudal vertebrae. (Auth.)

8184. McFadden, James T. (Univ. of Brit. Columbia, Inst. Fish., Vancouver, Brit. Columbia, Canada), and Edwin L. Cooper. 1964. POPULATION DYNAMICS OF BROWN TROUT IN DIFFERENT ENVIRONMENTS. Physiol Zool 37(4): 355-363; Biological Abstracts, Vol. 46, No. 6, Abst. No. 23294. 1965.

Ecological life tables were prepared for 5 natural populations of brown trout (Salmo trutta) with the observation that the density of these populations was relatively stationary. The components of these life tables (survival from egg to yearling, survival of adults, and age-specific fecundity) were compared to determine how the populations maintained their stationary state in different environments. Fecundity of populations in infertile streams is lower than that in fertile waters. Survival rates of populations in infertile waters must therefore be higher than those in fertile streams. Survival rates differ with size of the trout, and adjustments in survival to maintain stationary populations in infertile streams were observed at different sizes in different streams. (Auth.)

8185. Aliev, D.S. 1963. EXPERIMENTAL USE OF GRASS CARP (CTENOPHARYNGODON IDELLA) FOR CONTROLLING EXCESSIVE VEGETATION IN BODIES OF WATER. (OPYT ISPOL'ZOVANIYA BELOGO AMURA DLYA BOR'BY S ZARASTANIEM VODOEMOV). In: Materialy Vsesoyuznogo soveshchaniya po rybokhozyaistvennomu osvoeniyu rastilel' noyadnykh ryb - belogo amura i tolstolobika vodoemakh SSSR, 1961. (Contributions to the All-Union conference on the cultivation of the herbivores Ctenopharyngodon idella and Hypophthalmichthys molitrix in Russian waters. 1961). Akad Nauk Turkm SSR: Ashkhabad 89-92. From: Ref Zh Biol., 1964, No. 4I111. (Translation); Biological Abstracts, Vol. 46, No. 6, Abst. No. 23343. 1965.

Excessive weed growth in Turkmenian waters and irrigation canals has caused great damage to fish. Mechanical and chemical methods of control proved to be very expensive. It was suggested that herbivorous fishes be used for controlling vegetation in Turkmenian waters. Experiments were conducted

in the Karakum Canal. On May 12, 1961, 375 2-year-old grass carp were released into a body of water 1.8 ha in area (biomass of soft vegetation 1.25 kg/m^2, total biomass about 22.5 metric tons). The fish were 18-22.2 cm long and weighed 110-200 g, their overall live weight being 55.1 kg. There were 30.6 kg of fish per hectare. These fish completely cleared the water of underwater vegetation.

8186. Bauer, O. N., and E. A. Bogdanova. 1963. PROTOZOAL AND FUNGAL INFECTIONS IN REARED SALMONIDAE. (PROTOZOINYE I GRIBKOVYE ZABOLEVANIYA PRI VYRASHCHIVANII LOSOSEVYKH). Izv Gos Nauch-Issled Inst Ozern Rechn Rybn Khoz 54: 7-14. (English summ.). From: Ref Zh Biol, 1964, No. 7I89. (Translation); Biological Abstracts, Vol. 46, No. 6, Abst. No. 23351. 1965.

The incidence of disease among young salmonids in fish hatcheries of the USSR was investigated. Protozoa and fungi were found to cause heavy mortality of salmonid young as well as of sea and fresh water brown trout and rainbow trout, and of Pacific salmon. Myxosoma cerebralis, which causes whirling sickness in Salmonidae, was found in 2 trout hatcheries and on Sakhalin fish-farms. Successful control of ectoparasites has been attained through the use of malachite green and formalin.

8187. Efimov, V. I. 1963. SURVIVAL OF JUVENILE PINK SALMON (ONCORHYNCHUS GORBUSCHA) DURING THE FIRST YEAR OF LIFE, AND METHODS OF INCREASING THEIR VIABILITY. (VYZHIVAEMOST' MOLODI GORBUSHI V PERVOE LETO ZHIZNI I PUTI POVYSHENIYA EE ZHIZNESTOIKOSTI). In: Materialy rybokhozyaistvennogo issledovaniya Severnogo basseina. (Materials of fisheries research in the Northern basin). Murmansk 34-35. From: Ref Zh Biol, 1964, No. 7I83. (Translation); Biological Abstracts, Vol. 46, No. 6, Abst. No. 23369. 1965.

Observations are presented on the effect of predators on juvenile pink salmon in the Kandalakska fish hatchery. Stunted year-old juvenile pink salmon raised in experimental ponds were found to be preyed upon by year-old Salmo salar. It is essential to bear in mind that the release of Far Eastern salmon coincides with the intensive feeding of predators. The release of young should be organized at the beginning of the spring warming-up of the water, during the 2nd 10-day period in May. The rearing of juvenile pink salmon in prewarmed water of Arctic Circle fish hatcheries has been justified from a biological point of view. A scheme for accelerating the production of viable young is presented.

8188. Mindel', N. V. 1963. EPIDEMIOLOGY OF DIPLOSTOMATOSIS OF SALMONIDAE IN THE NARVA FISH HATCHERY. (EPIZOOTOLOGIYA DIPLOSTOMATOZA LOSOSEVYKH NA NARVSKOM RYBOVODNOM ZAVODE). Izv Gos Nauch-Issled Inst Ozern Rechn Rybn Khoz 54: 91-99. (German summ.); From: Ref. Zh. Biol., 1964, No. 7I93. (Translation); Biological Abstracts, Vol. 46, No. 6, Abst. No. 23404. 1965.

A total of 270 salmonid fingerlings, 450 pond snails and 11 sea gulls were examined for diplostomatosis. Sporocysts with tailed cercariae of Diplostomum spathaceus in various stages of development and sporocysts with stylet cercariae were found in mollusk livers. Heavy infection was observed in whitefish and nelma (Stenodus leucichthys nelma). The course of the disease includes an acute and a chronic form. The acute form is caused by mass penetration of cercariae into the body of the fish; the chronic form is associated with cataracts of the eyes. Control of diplostomatosis depends largely on the extermination of the snails.

8189. Putz, Robert E., and Glenn L. Hoffman. (Bur. Sport Fisheries & Wildlife, Eastern Fish Disease Lab., Kearneysville, W. Va.). 1964. STUDIES ON DACTYLOGYRUS CORPORALIS N. SP. (TREMATODA: MONOGENEA) FROM THE FALLFISH SEMOTILUS CORPORALIS. Proc. Helminthological Soc. of Washington, Vol. 31, No. 2, pp. 139-143.

Dactylogyrus corporalis n. sp. from the fallfish, Semotilus corporalis (Mitchill) is described along with its experimental life cycle and other biological observations. At 22° C the life cycle from egg to egg producing adult takes 13 to 14 days. After deposition the embryo develops eye spots within 2 to 3 days and hatches within 4 to 5 days. The oncomiracidium attaches to the fish within 24 hours after hatching. Eight days are required for development to maturity after attachment to the host.

In vitro oviposition rate is one egg per parasite every 17.5 min. at 23° C; site of infection is at the distal 1/4 of the host gill filament and the average parasite load in nature is 4.5 worms per fish. In nature the parasite appears to be host specific for S. corporalis, however, under laboratory conditions it was possible to infect goldfish. Pathology consists of whitish epithelial hyperplasia with subsequent degeneration of the distal tips of infected gill filaments. (Authors)

8190. Carlton, William G., and William B. Jackson (Dept. Biol., Bowling Green State Univ., Bowling Green, Ohio). 1964. THE USE OF SPINES FOR AGE DETERMINATION OF FISH. Turtox News 42(11): 282-283. Illus.; Biological Abstracts, Vol. 46, No. 7, Abst. No. 27583. 1965.

Technique for sectioning dorsal spine in order to count annular rings is described. Sections are cleared in 1% KOH for 1 week and stored in 10% formalin. --R. W. Dexter.

8191. Dadikyan, M. G. 1963. THE MAINTENANCE OF LARGE CATCHES OF SEVAN FISHES UNDER CONDITIONS OF LOW LAKE LEVELS. (SOKHRANENIE BOL'SHIKH ULOVOV SEVANSKIKH RYB V USLOVIYAKH PONIZHENIYA UROVNYA OZERA). In: Rybnoe khozyaistvo vnutrennykh vodoemov SSSR: (Fisheries of the inland waters of the USSR). Akad. Nauk SSSR: Moscow. 119-121. From: Ref Zh Biol.,

1964, No. 11I94. (Translation); Biological Abstracts Vol. 46, No. 8, Abst. No. 32624. 1965.

The stocks of lake trout, winter Sevan trout and "bodzhak" (a slow-growing form of Sevan trout) decreased as a result of curtailment of their spawning grounds due to a fall in lake water level. The fall in water level had an adverse effect on the conditions of the lake's affluents, which served as spawning grounds for "khramulya" (Varicorhinus capoeta) and trout. To keep up the large catches of Sevan fishes, a series of fish-cultural measures was carried out. The capture of spawning trout was everywhere forbidden. The number of eggs to be incubated at the fish hatcheries was raised to 70 million annually. The release of larvae was replaced by the release of juvenile fish. A pilot-plant technique for the incubation of "khramulya" eggs was worked out. Over the past 10 years the fish catch increased somewhat in comparison with the period prior to the fall in lake level. Up to 75% of the catch is provided by the artificial hatching of trout at the fish hatcheries.

8192. Poddubnyi, A. G. 1963. ON THE SIGNIFICANCE OF SUBMERGED FORESTS FOR THE FISH POPULATION OF THE RYBINSK RESERVOIR. (O ZNACHENII ZATOPLENNYKH LESOV DLYA RYBNOGO NASELENIYA VODOKHRANILISHCHA). Tr Inst Biol Vnut Vod Akad Nauk SSSR 6. 9. 184-194. From: Ref Zh Biol, 1964, No. 8I53. (Translation); Biological Abstracts, Vol. 46, No. 8, Abst. No. 32643. 1965.

Studies of submerged forests were carried out on fixed stations in the Rybinsk reservoir, monthly in 1959 and at least twice during the period of open water in 1953-61. Fishing was done by means of standard caprone gill-nets with mesh of 12 to 70 mm, and also by "botalnye" nets. Of 29 species reported from the Rybinsk reservoir, 20 occurred in the catches. The highest average catch was recorded from the submerged flood-plain forests; it was somewhat lower in inshore protected deadwoods, and lowest in open forests. The submerged forests are inhabited mainly by low-value fish (bleak, roach, white bream and perch) which form 77.3% of the total catch, while blue bream and chekhon (Pelecus cultratus) form 16.4%; bream, zander, pike and burbot form 6.0% of the catch. Low-value fish in submerged forests are well provided with spawning grounds and food. The most abundant fauna of the periphyton in the submerged forests is not utilized by bream; it is little utilized by other valuable commercial fishes, and well utilized by roach, white bream and ruffe. The presence in the reservoir of remains of trees and bushes, which serve as a convenient substrate for Dreissena, facilitates mass development of the latter, but because a substantial portion of its population is not used by the fish, it is not part of the trophic cycle. The massive growth of dense weeds over the bottom hampers development of the fishery and lowers the potential fish productivity of the reservoir. In clearing the bottom, vegetation should be left in parts of bays and inlets that are protected from strong wave action to provide shelter for young fish.

8193. Sharonov, I. V. 1963. LIVING CONDITIONS AND BEHAVIOR OF FISH BELOW THE V. I. LENIN HYDROELECTRIC POWER PLANT ON THE VOLGA. Tr Inst Biol Vnutr Vod Akad Naud SSSR 6. 9. 195-200. From: Ref Zh Biol, 1964, No. 8I54. (Translation); Biological Abstracts, Vol. 46, No. 8, Abst. No. 32650. 1965.

Hydrological conditions downstream from the power plant are characterized by seasonal and diurnal fluctuations in current speed and water level. In winter, early spring and fall the water temperature is higher here than in the reservoir, and lower in summer. The fish stock comprises endemic species which lived here prior to the damming of the Volga, as well as species which descended from the reservoir and moved into the lower part of the river to spawn and feed. The area between the dam and Bakhilov Island is inhabited by about 25 species of fish. Data from experimental catches of 1957-60 show a drop in the proportions of pike (Esox lucius), bream (Abramis brama) and osetr sturgeon (Acipenser guldenstádti) and a rise in the proportion of white bream (Blicca bjoerkna) and roach (Rutilus rutilus). The population of principal commercial species is characterized by a rather complex age structure with a marked preponderance of older age groups. Although the reproductive capacity of fish stocks below the dam is very high, it is rendered ineffective by unfavorable water-level conditions. Fish depart from the dam when the volume of flow of water increases, accompanied by a rise in water level and in current speed; they return when the volume of flow decreases.

8194. Dean, John Mark, and Clarence J. Goodnight. (Dept. Biol. Sci. Purdue Univ., Lafayette, Ind.). 1964. A COMPARATIVE STUDY OF CARBOHYDRATE METABOLISM IN FISH AS AFFECTED BY TEMPERATURE AND EXERCISE. Physiol. Zool., 37(3): 280-299. Illus.; Biological Abstracts, Vol. 46, No. 8, Abst. No. 32941. 1965.

An investigation was conducted to determine the effects of temperature and exercise upon some aspects of carbohydrate metabolism of fish at 2 temperatures. The parameters studied were blood glucose, blood lactic acid, muscle and liver glycogen. The fish studied were Micropterus salmoides salmoides, Pomoxis annularis, Ictalurus melas and Lepomis macrochirus. These fish exist in a wide range of habitats and showed different physiological responses. All species increased their blood lactic acid with exercise at both high and low temperatures. All species exhibited a decrease in muscle glycogen with exercise but the liver-glycogen results varied. Pomoxis and Ictalurus increased their blood glucose at lower temperatures. (Authors)

8195. Schneider, Hans. (Zoophysiol. Inst.; Univ. Tubingen, West Germany). 1964. FISH ALSO HAVE A "LANGUAGE". (AUCH FISCHE HABEN EINE "SPRACHE"). Umschau 64(6): 166-170. Illus.; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37113. 1965.

The sound emitting mechanism of various fish is studied. The sound is used by males of Adplodinotus

grunniens to lure the females, the anemone fish use sound as an aggressive signal and the Therapon jarbua emit an intensive noise which is answered by their comrades. It is not as yet known to what extent fish communicate together, but the varying significance of the sound emitted is beyond doubt. --J. Burnett.

8196. Welch, E. B., and J. C. Spindler. (U.S. Geol. Surv., Tacoma, Wash.). 1964. DDT PERSISTENCE AND ITS EFFECT ON AQUATIC INSECTS AND FISH AFTER AN AERIAL APPLICATION. J. Water Pollut. Contr. Federation 36(10): 1285-1292. Map; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37217. 1965.

Aerial application of DDT for spruce budworm control at a 0.5 lb/acre rate on a forested 100,000 acre drainage area was followed by a program of DDT measurement in the stream and determination of any adverse effects on the aquatic macroinvertebrate population. Although a 0.25 mile strip on either side of important trout streams was not sprayed, mean DDT levels in tributary streams reached 0.003 to 0.02 ppm, resulting in extensive bottom fauna mortalities in certain streams, accompanied by trout mortalities attributed to ingestion of insects containing DDT. No evidence of permanent or long-term fisheries damage was noted at any point in the spray test area, although the possibility was not excluded. --I. Gellman.

8197. Bakshtanskii, E. L. 1963. OBSERVATIONS ON THE DOWNSTREAM MIGRATION OF YOUNG PINK SALMON (ONCORHYNCHUS GORBUSCHA) AND CHUM SALMON (O. KETA) IN THE EUROPEAN NORTH. (NABLYUDENIYA ZA SAKTOM MOLODI GORBUSHI I KETY NA EVROPEISKOM SEVERE). Tr Polyarnogo Nauch-Issled Proektn Inst Morskogo Rybn Khoz Okeanogr 15. 35-43. From: Ref Zh Biol, 1964, No. 12I61. (Translation); Biological Abstracts, Vol. 46, No. 9, Abst. No. 37225. 1965.

In April and June of 1957-58, larval pink salmon weighing 165.5 mg were released in the Taybola fish hatchery located on the Kola River 77 miles from the delta, and fry weighing 200.5 mg were released in the lower course of the Kola. In 1959-61, young of pink and chum salmon were released into the Kola in the hatchery area. Smaller young of pink salmon (0.22-0.25 g), released between May 29 and June 11, 1959, stayed longer in the river, feeding actively in shoal waters, while larger ones (0.548 g) descended rapidly to the sea in 1961. A similar pattern was observed for chum salmon. Because of the low water temperature (0° C) in winter and its rapid rise in spring, the Ura Inlet hatchery is obliged to release juvenile pink salmon (0.22-0.23 g) and chum (0.51 g); these, on the day of their release, enter the inland part of Ura Inlet where they are destroyed en masse by predators (coal-fish, cod, haddock, and herring), and are subjected to stranding at low tide. Pink salmon descend more rapidly to the sea, whereas small chum salmon remain for a longer time in less saline waters. Young pink salmon, released on May 27, 1961 from the Umba fish hatchery located at a distance of 3-4 km from the delta, reached the sea in 2 hours, and almost all of them left the coast on the first low tide.

8198. Laycock, George. 1966. NEW NURSERIES FOR PIKE. Field and Stream, Vol. 70, No. 11, pp. 10-12, 14, 16.

Drainage of marshes in north central states greatly reduced the spawning habitat of northern pike. Development of water level controls on once-drained marshes now provides better than original spawning habitat. Where feasible drainage of spawning marshes facilitates control of unwanted fish species. It is thought that an acre of spawning marsh to 30 acres of fishing water will give about the maximum production. Breeder pike are caught and put in the controlled marshes, two males and one female per acre of marsh. Pike are released by opening gate when young have reached proper size, about 2 inches at which time they start eating each other.

8199. Trueblood, Ted. 1966. THE MISPLACED SALMON OF HOSMER LAKE. Field and Stream, Vol. 70, No. 11, pp. 49-51, 81-83.

Fingerling Atlantic salmon were first stocked in this Oregon lake in 1958 and the first open season was in 1961. There is no evidence of natural reproduction so current regulations call for barbless hooks and return of all fish to the lake. The Atlantic salmon, running up to 8-1/2 pounds appear to provide plenty of fun for the anglers drawn to this easterner gone western.

8200. Beaumariage, Dale S. (Fla. Bd. of Conserv., Marine Lab., St. Petersburg, Fla.). 1964. RETURNS FROM THE 1963 SCHLITZ TAGGING PROGRAM. Florida State Board Conserv. Tech. Ser. 43. 1-34. Map.; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37233. 1965.

A total of 3903 fishes of commercial and sports importance representing 48 species and 20 families were released during the third annual cooperative tagging program. A total of 922 (23.6%) were recovered through Sept. 1964. Ninety-one additional returns from previous programs were recovered during the 1963 program. This data is presented with the discussion of the appropriate species. Indications of growth are presented from release and recapture measurements taken on fish free for a year or more. Indications of movement are reported for littoral zone fishes. Most significant is the apparent northerly trend in bluefish movement as revealed by the return of 14 tagged individuals. These fish were tagged during Feb. near the Ft. Pierce Inlet, and were returned from March through April as far north as Cocoa, Florida. King mackerel were tagged for the first time in Florida with sphaghetti tags. This tag was used on other species as well. Gross data on tag efficiency for Petersen, internal, and spaghetti tags are presented in the final table. (Auth.)

8201. Burmakin, E. V. 1963. LETHAL CONCENTRATIONS OF POLYCHLORPINENE FOR SOME FRESHWATER FISH. (LETAL'NYE KONTSENTRATSII POLIKHLORPINENA DLYA NEKOTORYKH

PRESNOVODNYKH RYB). Izv Gos Nauch-Issled Inst Ozern Rechn Rybn Khoz 55: 26-29. (English summ.). From: Ref Zh Biol, 1964, No. 15I120. (Translation); Biological Abstracts, Vol. 46, No. 9, Abst. No. 37239. 1965.

Results of 89 experiments on the determination of polychlorpinene concentrations lethal to fish are reported. For carp the lethal concentration was 1.0 mg/l and higher; for perch 0.1; for ruffee 0.2; for pike 0.2; for roach 0.5; for peled (Coregonus peled) 1.0; for burbot 1.0 mg/l. The water temperature during the experiments ranged from 5 to 18°C. Experiments under natural conditions showed that, in shallow lakes at high temperatures, a polychlorpinene concentration of 0.05 mg/l was required to kill off various species of fish. Treatment of lakes with polychlorpinene at a concentration of 0.01 mg/l was insufficient for a total extermination of fish.

8202. Chervinski, J. (Fish Breeding Res. Sta., Dor, Israel). 1964. PRELIMINARY EXPERIMENTS IN CICHLID HYBRIDS. Bamidgeh 16(3): 95-105. Illus.; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37241. 1965.

Thirty male and ten female fish, evidently hybrids between Tilapia nilotica and T. galilaea, were encountered in an experimental fish pond at Dor, Israel. Nevertheless, deliberate attempts to interbreed the two species failed. The characteristics of the presumed hybrids are described. They were able to breed among themselves, giving a great predominance of males. The growth rate of the hybrids was satisfactory. Crosses were successfully made between the hybrids and the two parent species. The resulting offspring were intermediate in their characteristics. --C. C. Davis.

8203. Herbert, D. W. M., and A. C. Wakeford. (Water Pollut. Res. Lab., Stevenage, Herts, England). 1964. THE SUSCEPTIBILITY OF SALMONID FISH TO POISONS UNDER ESTUARINE CONDITIONS. I. ZINC SULPHATE. Air Water Pollut 8(3/4): 261-265. Illus.; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37260. 1965.

The resistance of yearling rainbow trout and Atlantic salmon smolts to zinc sulfate increases with salinity up to 30-40% sea water, in which these species can withstand for 2 days respectively 15 and 13 times as much zinc sulfate as in fresh water. Further increase in salinity to 72% sea water reduces tolerance for zinc salt. Salmon smolts were more susceptible to zinc poisoning than trout in fresh water and at all salinities tested. (Authors)

8204. Heyamoto, H. (U.S. Bur. Commercial Fish., Exploratory Fish. and Gear Res. Base, Seattle, Wash.). 1963. AVAILABILITY OF SMALL SALMON OFF THE COLUMBIA RIVER. Pacific Marine Fish. Comm. Bull. 6. 82-88. Illus. Map.; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37262. 1965.

Although not many chinooks were caught in the North Head area, 82% of the catch was of sub-legal size. It would seem that the high percentage of small chinooks in this area would be sufficient to term it a small fish nursery area; however, if the North Head area, such as was investigated, had been closed during the year of tagging, the net saving would have been very small because of the scarcity of fish. There is some evidence, however, that conditions were not normal during that season. There generally is a fairly good fishing period during the early part of the season in this area which did not materialize, but whether or not this would alter the size composition is speculative. The area south of the Columbia River which was investigated on the second day of each trip because of poor fishing on the North Head side, also showed an 82% catch of sub-legal size chinooks. If both of these areas were considered "nursery" areas for salmon, the problem of area delineation would be difficult and would require a more intensive study by time and space than the investigation just concluded. Another complicating factor would be in determining the possible variations occurring within areas from year to year. The returns of chinooks tagged in the two areas showed similar movement in that the immature or small fish moved northward. Silvers were available in both areas during the test fishing period, with better success on the south side. During August "jacks" appeared in the fishery in both areas. The minimum size regulation prevented this group of silvers from being taken although they were precociously developed and would not remain in the ocean another year. The returns from silvers tagged in the two areas, as in the case of the chinook, displayed similar movement patterns. The returns from the June and July tagging were from areas to the north, and the Aug. tagging returns came from the Columbia River and its tributaries. The two returns from the three pink salmon tagged showed northerly movement. One was taken in Port Susan in Puget Sound and the other in the Fraser River in Canada. (Auth.)

8205. Lahav, M. (Hebrew Univ.-Hadassah Med. Sch., Jerusalem, Israel), S. Sarig, and M. Shilo. 1964. THE ERADICATION OF LERNAEA IN STORAGE PONDS OF CARPS THROUGH DESTRUCTION OF THE COPEPODIDAL STAGE BY DIPTEREX. Bamidgeh 16(3): 87-94; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37285. 1965.

Carps infested with Lernaea were placed in aquaria containing one of four test insecticides; gammexane, malathion, Dipterex or D. D. V. P. Concentrations of gammexane and malathion of sufficient strength to destroy the parasites were toxic also to the carp. In 0.5% solutions of Dipterex and of D. D. V. P. the fish were not harmed, nor were the adult and naupliar copepods. On the other hand, the copepodid stages of the Lernaea were killed rapidly at this concentration. Ponds with heavily infested fish were treated with the insecticides to give a concentration of 0.5%. The copepodids were greatly reduced on the fish after one treatment. Adult Lernaea disappeared after 3-4 treatments at weekly intervals. --C. C. Davis

8206. Sutyagin, V. S., V. M. Ivasik, and N. I. Borona. 1963. WAYS OF REDUCING DISEASES OF CARP IN THE "KHODOROV" FISH HATCHERY IN THE L'VOV OBLAST. (PUTI OGRANICHENIYA

ZABOLEVANII KARPA V PRUDOVOM KHOZYAISTVE "KHODOROV" L'VOVSKOI OBLASTI). In: Problemy parasitologii. (Problems of parasitology). Akad. Nauk Ukr. SSR: Kiev. 475-476. From: Ref Zh Biol, 1964, No. 12I110. (Translation); Biological Abstracts, Vol. 46, No. 9, Abst. No. 37339. 1965.

The incidence of disease among carp was reduced by (1) harrowing and drying of ponds; (2) plowing the bottoms of growing ponds and planting cultivated crops; (3) disinfecting silted-up parts of the beds; (4) deepening water-supply canals; (5) prophylactic baths, and so on.

8207. Vanstone, W. E., Eve Roberts, and H. Tsuyuki. (Technol. Res. Lab., Vancouver, Brit. Columbia, Canada). 1964. CHANGES IN THE MULTIPLE HEMOGLOBIN PATTERNS OF SOME PACIFIC SALMON, GENUS ONCORHYNCHUS, DURING THE PARR-SMOLT TRANSFORMATION. Can Jour. Physiol. Pharmacol. 42(6): 697-703. Illus.; Biological Abstracts, Vol. 46, No. 9, Abst. No. 37348. 1965.

By employing starch gel electrophoresis it has been found that coho salmon fry and smolts contain 10 anodal-migrating, and 12 cathodal-migrating, hemoglobin fractions. Prepuberal 1-1/2-year-old coho salmon caught at sea and sexually mature adults taken from fresh water contained the same anodal fractions and at approximately the same concentrations as were found in fry and smolts. However, the concentrations of the cathodal fractions had increased so that these were very nearly equal to those of the anodal fractions. Similar hemoglobin changes were found in both anadromous and land-locked sockeye salmon, but in this species seven anodal and six cathodal fractions were present at their "adult" concentrations in fry and smolts. Six other cathodal fractions which were absent entirely or present only in trace amounts in fry and smolts increased to their adult concentrations some time later in the life cycle of both varieties of sockeye. It is postulated that these changes reflect an ecological adaption to life in the ocean. (Authors)

8208. Lederis, K. (Dept. Pharmacol., Univ. Bristol, Bristol, England). 1964. FINE STRUCTURE AND HORMONE CONTENT OF THE HYPOTHALAMO-NEUROHYPOPHYSIAL SYSTEM OF THE RAINBOW TROUT (SALMO IRIDEUS) EXPOSED TO SEA WATER. Gen Comp Endocrinol 4(6): 638-661. Illus.; Biological Abstracts, Vol. 46, No. 9, Abst. No. 38348. 1965.

Effects of exposure to sea water on the hormone content and on the fine structure of the hypothalamo-neurohypophysial system of the rainbow trout (Salmo irrideus) were investigated. After 2 hours in sea water the arginine-vasoticin content of the pituitary fell by 50%; the ichthyotocin content did not change appreciably. The neurohypophysial hormone content in the glands of the fish after 4 and 8 hours in sea water was similar to that of the fresh water controls. Depletion of the osmiophilic material from the elementary granules of some nerve swellings was seen in the neurohypophysis of trout kept in sea water for 2 hours. An increased abundance of elementary granules in the preoptic neurones of the same fish was evident. The electron microscopic appearance of the neurohypophysis of trout kept in sea water for 4-8 hours did not differ from the fresh-water controls. In the preoptic neurones of the fish exposed to sea water for 4-8 hours the number and distribution of elementary granules was comparable to that of the control trout. However, in common with the "2-hour fish", changes were seen in the perikarya of the preoptic neurones of all sea-water-treated fish, namely, diminished number of mitochondria, fewer large granules in the Golgi area, and an increased vacuolation of the cytoplasm. Elementary granules of 2 size ranges (one 1320-2370 Å, mean diameter 1850 $\pm$ 69 Å; the other 1180-1710 Å, mean diameter 1380 $\pm$ 49 Å) and multilamellar bodies were seen in nerve fiber swellings of the trout neurohypophysis. The physiological function of the hypothalamo-neurohypophysial system in osmoregulation of teleosts is discussed. (Authors)

8209. Finstad, Joanne, and Robert A. Good. (Univ. of Minn., Minneapolis, Minn.). 1964. THE EVOLUTION OF THE IMMUNE RESPONSE. III. IMMUNOLOGIC RESPONSES IN THE LAMPREY. Jour. Exp. Med. 120 (6): 1151-1168. Illus; Biological Abstracts, Vol. 46, No. 9, Abst. No. 39543. 1965.

Studies of the immune response have been carried out in more than 1700 sea lampreys (Petromyzon marinus) representing three stages of life cycle. They were unable to clear bovine serum albumin, bocine gamma globulin, or T_2 bacteriophage from the circulation following intramuscular injection, and formed no antibody to these antigens or to keyhole limpet hemocyanin. Hemocyanin was cleared, however. Many of the lampreys did form small amounts of antibody to killed Brucella abortus. All the animals tested retained autografts and rejected homografts. Animals that survived administration of Freund's adjuvant fortified with Mycobacterium tuberculosis later showed a delayed allergic response to old tuberculin. These lampreys also showed lymphoid cell proliferation in the protovertebral arch. These data, together with earlier morphologic studies, suggest that in the lamprey is reflected the coordinate evolution of a primitive thymus, primitive spleen containing lymphoid foci, a family of lymphocytes in the peripheral blood, and capacity for gamma globulin synthesis and expression of adaptive immunity. (Authors)

8210. Wolf, Ken and S. F. Snieszko. (Bur. Sport Fisheries & Wildlife, Eastern Fish Disease Lab., Kearneysville, West Virginia). 1963. USES OF ANTIBIOTICS AND OTHER ANTIMICROBIALS IN THERAPY OF DISEASES OF FISHES. Antimicrobial Agents and Chemotherapy—1963. Proceedings of a Conference, 1963. American Society for Microbiology: 115 Huron View, Ann Arbor, Mich. 1964. p. 597-603.

Some aspects of American fish culture are presented to provide a background for understanding the implications of using antimicrobials in therapy of bacterial diseases of fishes. The antimicrobials are discussed in order of their usage: sulfonamides,

antibiotics, and nitrofurans. Other than therapeutic levels, applications of sulfonamides in salmonid fishes provide the only quantitative work on absorption, tissue levels, blood levels, clearance, and toxic reactions. A number of antibiotics have been effectively used, but only one preliminary study of blood and tissue levels has been made. Nitrofurans have been used least, and only limited data are available on therapeutic dosages under experimental conditions. (Authors)

8211. Hunn, J. B. (Eastern Fish Dis. Lab., Kearneysville, West Virginia). 1964. SOME PATHO-PHYSIOLOGIC EFFECTS OF BACTERIAL KIDNEY DISEASE IN BROOK TROUT. Proc. Soc. Exp. Biol. Med. 117(2): 383-385. Illus.

Examination of healthy, yearling brook trout (Salvelinus fontinalis) and those diseased with Corynebacterium shows that in diseased fish the hematocrit was reduced by 44% compared to normal (39 ± 1 vs. 22 ± 1) while the total plasma protein dropped 52% (4.5 ± 0.1 g% vs. 2.2 ± 0.2 g%). Electrophoretic analysis of the plasma proteins indicates that the faster migrating fractions (albumin?) are the most drastically reduced. It has also been observed that twice as many males as females were diseased. (Auth.)

8212. Rounsefell, George A. (Ala. Mar. Resources Lab., Dauphin Island, Ala.). 1964. PRECONSTRUCTION STUDY OF THE FISHERIES OF THE ESTUARINE AREAS TRAVERSED BY THE MISSISSIPPI RIVER-GULF OUTLET PROJECT. U.S. Fish and Wildlife Service Fishery Bulletin 63(2): 373-393. Illus. Maps.

Hydrographical and biological data were collected from April 1959 through March 1961 at selected stations in the marsh and bayou areas traversed by the Mississippi River-Gulf Outlet Channel between New Orleans and Breton Sound to provide preconstruction data needed for later assessment of the effects on the fauna of such a wide and deep channel connected at the Gulf end with water of high salinity. The channel will raise salinities over most of the project area. This should not greatly affect the fishes of the area which are preponderately euryhaline. It should have an adverse effect on abundance of the blue crab. The possible effect on the white shrimp is obscured by their avoidance of the open waters of Lake Borgne and their preference for the shoal protected marshes. (Auth.)

8213. Royce, William F. (Fish Res. Inst., Univ. Wash., Seattle, Wash.). 1964. A MORPHOMETRIC STUDY OF YELLOWFIN TUNA THUNNUS ALBACARES (BONNATERRE). U.S. Fish and Wildlife Service Fishery Bulletin 63(2): 395-443. Illus. Map.

Morphometric measurements were compared for 4,180 yellowfin tuna from 28 locations in the Pacific Ocean; from off Angola, Africa, in the Atlantic Ocean; and from off Somaliland, Africa, in the Indian Ocean. The measurements used were head length; pectoral fin length; heights of second dorsal and anal fins; distances from snout to insertion of first dorsal fin, to second dorsal fin, anal fin, and ventral fin; distance from insertion of ventral to anterior edge of vent; and greatest body depth. Each measurement was related to fork length by regression analysis, and each relationship was considered a character. Curvilinear regression due to allometric growth was controlled by transforming some data to logarithms and by separating all samples into small, medium, and large size groups (less than 80, 80-120, and greater than 120 cm fork lengths). Mean character sizes were determined for each sample at lengths of 65, 100, and 140 cm. There is a cline in most characters from samples taken along the Pacific Equator between the vicinity of Costa Rica and the Caroline Islands. Yellowfin from the eastern Pacific have larger heads and greater distances from snout to insertion of first dorsal, second dorsal, ventral, and anal fins; a greater distance from insertion of ventral fins to insertion of anal fin; and a greater body depth. On the other hand, they have shorter pectoral fins and much shorter anal and second dorsal fins. The samples from the more temperate parts of the Pacific and from off the coasts of Africa differed little from some part of this cline. A multiple character comparison of overlap among samples from near the Pacific Equator showed less than 50-percent overlap between samples separated by 1500 miles, less than 25-percent overlap between samples separated by 3000 miles, and less than 6-percent overlap between samples separated by 6000 miles. The possibility of long intermigrations among the equatorial stocks seems remote. The full variation in length of the pectoral fin and heights of second dorsal and anal fins, which most authors have used to separate the species of yellowfin, occurs within the cline along the Pacific Equator. This occurrence, plus the continuous circumtropical high sea distribution of the yellowfin, indicates a single worldwide species. The appropriate name is Thunnus albacares (Bonnaterre) 1788.

8214. Zwillenberg, L. O. (Hyg.-Bakteriol. Inst. Univ., Bern, Switzerland), and Helga H. L. Zwillenberg. 1964. ELECTRONMICROSCOPIC STUDIES OF RAINBOW TROUT WITH INFECTIOUS KIDNEY SWELLING AND LIVER DEGENERATION. (ELEKTRONENMIKROSKOPISCHE UNTERSUCHUNGEN AN REGENBOGENFORELLEN MIT INFEKTIOSER NIERENSCHWELLUNGUND LEBERDEGENERATION). Arch Ges Virusforsch 14(3): 319-331. Illus. (English summ.); Biological Abstracts, Vol. 46, No. 10, Abst. No. 44383. 1965.

Thin sections of liver, kidney and spleen of rainbow trout with "infectious kidney swelling and liver degeneration" (Schäperclaus, 1954) were examined with the electron microscope. In all three organs virus-like particles were found inside fragments of phagocytosed erythrocytes undergoing digestion. (Authors)

8215. Wittenberg, Jonathan B. (Albert Einstein Coll. Med., Yeshiva Univ., New York, N.Y.), Mary J. Schwend, and Beatrice A. Wittenberg. 1964. THE SECRETION OF OXYGEN INTO THE

SWIM-BLADDER OF FISH. III. THE ROLE OF CARBON DIOXIDE. Jour. Gen. Physiol. 48(2): 337-355. Illus.; Biological Abstracts, Vol. 46, No. 10, Abst. No. 42108. 1965.

The secretion of carbon dioxide accompanying the secretion of oxygen into the swim-bladder of the bluefish is examined in order to distinguish among several theories which have been proposed to describe the operation of the rete mirabile, a vascular countercurrent exchange organ. Carbon dioxide may comprise 27% of the gas secreted, corresponding to a partial pressure of 275 mm Hg. This is greater than the partial pressure that would be generated by acidifying arterial blood (about 55 mm Hg). The rate of secretion is very much greater than the probable rate of metabolic formation of carbon dioxide in the gas-secreting complex. It is approximately equivalent to the probable rate of glycolytic generation of lactic acid in the gas gland. It is concluded that carbon dioxide brought into the swim-bladder is liberated from blood by the addition of lactic acid. The rete mirabile must act to multiply the primary partial pressure of carbon dioxide produced by acidification of the blood. The function of the rete mirabile as a countercurrent multiplier has been proposed by Kuhn, W., Ramel, A., Kuhn, H. J., and Marti, E., Experientia, 1963, 19, 497. These provide strong support for their theory. The unique structure of the gas-secreting complex of the swim-bladder of the bluefish, Pomatomus saltatrix L., is described. (Authors)

8216. Zaitsev, Yu. P., and G. G. Polikarpov. 1964. PROBLEMS OF THE RADIOECOLOGY OF THE HYPONEUSTON. (VOPROSY RADIOEKOLOGII GIPONEISTONA). Okeanologiya 4(3): 423-430. Illus.; Biological Abstracts, Vol. 46, No. 11, Abst. No. 46282. 1965.

After reviewing basic facts about the hyponeuston, the authors discuss interaction between radioactive surroundings and the hyponeuston, including the biological action of radioactive substances on pelagic fish roe. The risk of diminishing fish stocks as a result of radioactive contamination of the hydrosphere is considered. --M. M. Das

8217. Hubbs, Clark (Dept. Zool., Univ. Tex., Austin, Texas), and James E. Deacon. 1964. ADDITIONAL INTRODUCTIONS OF TROPICAL FISHES INTO SOUTHERN NEVADA. Southwestern Natur. 9(4): 249-251.; Biological Abstracts, Vol. 46, No. 11, Abst. No. 46296. 1965.

Exotic fishes that may compete with local endemics in the desert Southwest have recently been introduced into springs in southern Nevada. One species, Cichlasoma severum, not previously recorded in the United States, is added to the list of introduced Nevada fishes. Three species, Mollienesia latipinna, M. mexicana, and C. nigrofasciatum, are shown to have been moved more than 80 miles within 15 months. (Authors)

8218. Krauel, Kathryn K., and George J. Ridgway. (Bur. Commercial Fish., Seattle, Wash.). 1963. IMMUNOELECTROPHORETIC STUDIES OF RED SALMON (ONCORHYNCHUS NERKA) SERUM. Int. Arch. Allergy Appl. Immunol. 23(5): 246-253. Illus.; Biological Abstracts, Vol. 46, No. 11, Abst. No. 48676. 1965.

A modification of the micro-immunoelectrophoresis method of Scheidegger using the Spinco Model R Paper Electrophoresis apparatus with water-cooled slides is described. The mobilities of antigens present in red salmon sera are compared with the mobilities of those in human sera. Pre-albumins and gamma globulins, although present, are less apparent in salmon than in human serum. Albumin, alpha-1, alpha-2 and beta globulins are well represented. A comparison is made of the antigens present in 50 red salmon sera. Evidence is presented for polymorphism in pre-albumin and globulin components. A lipoprotein antigen present only in mature female salmon is shown to migrate as an alpha-2 globulin in agar. (Authors)

8219. Dalgaard-Mikkelsen, S. (Veterinaer-og Landbohojskole, Copenhagen, Denmark), and C. J. Rasmussen. 1964. RESIDUES OF SULFAMERAZINE IN TROUTS AFTER TREATMENT FOR FURUNCULOSIS. (RESTKONCENTRATIONER AF SULFAMERAZIN I ORREDER EFTER FURUNKULOSEBEHANDLING). Nord Veterinaer Med 16(5): 473-479. Illus.; (English and German summ); Biological Abstracts, Vol. 46, No. 11, Abst. No. 48938. 1965.

Rainbow trout weighing 150-200 g were treated with sulfamerazine at a daily dose of 200 mg/kg given in the feed after 3 days treatment, no treatment for 1 day and treatment for another 2 days. Residues of sulfamerazine were estimated in the musculature and the liver and the initial decline and the comprehensive acetylation in the liver tissue recorded. Elimination was faster from the musculature than from the liver and was independent of the H_2O temperature. At H_2O temperatures above 10° C, 4 weeks must elapse from treatment to delivery so that the musculature as well as the liver is free from sulfamerazine residues. At lower H_2O temperatures, a waiting period of at least 6 weeks is necessary. (Authors)

8220. Rasmussen, C. J. (Dansk Forsogsdamkltur, Brons, Denmark). 1964. FURUNCULOSIS IN FARM TROUT. (FURUNKULOSE HOS DAMORREDER). Nord Veterinaer Med 16(5): 463-472. (English and German summ); Biological Abstracts, Vol. 46, No. 11, Abst. No. 48955. 1965.

Furunculosis (caused by Aeromonas salmonicida) is the most common bacterial disease in Danish trout farms. An account of the progress of the control of furunculosis is given. Excellent results were obtained by using a prophylactic treatment with sulfamerazine combined with ordinary sanitary measures (immediate removal of all dead fish). With an interval of about 2 weeks, 0.2 g of sulfamerazine/kg trout was given daily for 3-4 days. Treatment is administered daily for 3 days. After a pause of 1 day, treatment is continued for another 2 days and repeated if necessary. (Auth).

8221. Meyer, Marvin C. (Dept. Zool., Univ. Maine, Orono, Maine), and Edward S. Robinson. 1963. DESCRIPTION AND OCCURRENCE OF DIPHYLLOBOTHRIUM SEBAGO (WARD, 1910). Jour. Parasitol., 49(6): 969-973. Illus.; Biological Abstracts, Vol. 46, No. 11, Abst. No. 50148. 1965.

Diphyllobothrium sebago (Ward, 1910) from Maine is described and compared with closely related species. Plerocercoids infect the land-locked salmon, brook trout, and American smelt. Adults occur in the herring gull. Experimental definitive hosts include the gull, cat, dog, golden hamster, red fox, and white rat. (Authors)

8222. Lom, Jiri (Czech. Acad. Sci., Protozool. Dept. Inst. Parasitology, Praha, Czechoslovakia), and Glenn L. Hoffman. 1964. GEOGRAPHIC DISTRIBUTION OF SOME SPECIES OF TRICHODINIDS (CILIATA: PERITRICHA) PARASITIC ON FISHES. Jour. Parasitol. 50(1): 30-35. Illus.

North American Trichodina from Carassius auratus, Lepomis cyanellus, L. macrochirus, Micropterus salmoides, and Rhinichthys atratulus have been studied by the silver-impregnation method and compared with European species. T. reticulata Hirschmann and Partsch, 1955, and T. (Foliella) subtilis Lom, 1959, originally described from European goldfish, are herein recorded from North America also. T. fultoni Davis, 1947, from Lepomis cyanellus, Micropterus salmoides, and Rhinichthys atratulus is redescribed, and T. domerguei f. magna Lom, 1961, described from European tench and gudgeon, is considered a synonym. A Trichodina sp. from the gills of Lepomis macrochirus is described; it is almost identical with T. nigra Lom, 1961, from European Rutilus, T. discoidea from centrarchids, and T. tumefaciens from Cottus of North America. Other North American trichodinids are reviewed briefly. (Authors)

8223. Halstead, Bruce W. (World Life Res. Inst., Colton, Calif.). 1964. FISH POISONINGS: THEIR DIAGNOSIS, PHARMACOLOGY, AND TREATMENT. Clin. Pharmacol. Therap. 5(5): 615-627; Biological Abstracts, Vol. 46, No. 12, Abst. No. 52613. 1965.

The general subject of fish poisonings is reviewed. Fish poisoning concerns both oral and parenteral toxins. Four general types of fish poisonings are recognized: ichthyosarcotoxins, of which there are at least 9 kinds; ichthyootoxism; ichthyohemotoxism; and ichthyocanthotoxism. The pharmacology and chemistry of fish poisons are discussed, but most of them have not been characterized. Treatment for the most part is symptomatic. (Auth.)

8224. Maitland, Peter S. (Dept. Zool., Univ. Glasgow, Glasgow, Scotland). 1965. THE FEEDING RELATIONSHIPS OF SALMON, TROUT, MINNOWS, STONE LOACH AND THREE-SPINED STICKLEBACKS IN THE RIVER ENDRICK, SCOTLAND. Jour. Animal Ecology 34(1): 109-133. Illus.; Biological Abstracts, Vol. 46, No. 12, Abst. No. 50886. 1965.

The food of Salmo salar, S. trutta, Phoxinus phoxinus, Nemacheilus barbatula, and Gasterosteus aculeatus, was assessed by examining the stomach contents of 1,435 specimens of these fish. Most fish were taken from a single tributary stream and the composition of its bottom fauna was estimated by taking monthly samples from the dominant substrate. Though the diet of each of the 5 species of fish was characteristic in some way, all were found to feed on the common aquatic invertebrates present (e. g. Baetis, Gammarus and Orthocladius). Surface organisms formed a large part of the food of trout but were less important to salmon and minnows, and only rarely taken by stone loach and three-spined sticklebacks. The availability of certain invertebrates to fish was assessed by comparing the composition by bulk of the bottom fauna with that of the aquatic invertebrates eaten by each fish species. The common invertebrates present exhibited availability factors which varied from one species to another, and which also depended upon which fish species was involved. Competition among these fish is discussed: it appears that while each species has a characteristic diet, all have food items in common and competition among them is likely, its degree probably being determined by the abundance of the food items being competed for. (Auth.)

8225. Sprague, J. B. (Fish. Res. Board Can., St. Andrews, New Brunswick, Can.). 1964. AVOIDANCE OF COPPER-ZINC SOLUTIONS BY YOUNG SALMON IN THE LABORATORY. Jour. Water Pollut. Contr. Fed. 36(8): 990-1004. Illus.; Biological Abstracts, Vol. 46, No. 12, Abst. No. 50892. 1965.

Avoidance reactions of Atlantic salmon were studied in soft waters containing copper, zinc, and mixtures of the 2 cations by measuring time spent in control and modified portions of the test chamber and whether length of visits in each portion differed significantly. Avoidance thresholds were 4.3 mg/l of Cu, 56 mg/l of Zn, and a mixture of 2.4 mg/l Cu plus 9.1 mg/l Zn. The concentration at which avoidance was noted were 0.10, 0.14, and 0.05 of the ILL values (incipient lethal levels) for these materials. Retesting of fish demonstrated no significant acclimatization or training effects. --I. Gellman.

8226. Fabian, G. (Inst. Zool., Agr. Univ., Godollo, Hung.), G. Molnar, and I. Tolg. 1963. COMPARATIVE DATA AND ENZYME KINETIC CALCULATIONS ON CHANGES CAUSED BY TEMPERATURE IN THE DURATION OF GASTRIC DIGESTION OF SOME PREDATORY FISHES. Acta Biol Acad Sci Hung 14(2): 123-129. Illus. (Ger. and Russ. summ.); Biological Abstracts, Vol. 46, No. 12, Abst. No. 51492. 1965.

The length of time required for gastric digestion by pike perch (Lucioperca lucioperca), perch (Perca fluviatilis), largemouth bass (Micropterus salmoides) and sheatfish (Silurus glanis) at 5, 10, 15, 20 and 25° C was examined. Data pertaining to all 4 species was expressed in percent of the digestion period registered at 5° C. As to the effect of temperature on the duration of gastric digestion considerable differences were found in the examined species. It was pointed out that the

curve of gastric digestion plotted against temperature may be characterized by a quadratic equation, and that with increasing temperature the period of gastric digestion diminishes according to geometrical progression. The duration of gastric digestion decreased from the values established at 5°C to 11% in pike perch, to 18% in perch, to 17% in largemouth bass and to 10% in sheat fish when a temperature of 25°C was applied. The data were also evaluated from the aspect of ferment kinetics. The graphic representation of experimental records by the Arrhenius equation yielded straight lines from which the activation energy could be calculated. (Authors)

8227. Li, M. F., and James E. Stewart. (Fish. Res. Board Can., Technol. Res. Lab., Halifax, Nova Scotia, Canada). 1965. A QUANTITATIVE STUDY OF THE EFFECTS OF NATURALLY OCCURRING SUPPLEMENTS ON THE GROWTH OF RAINBOW TROUT (SALMO GAIRDNERI) GONADAL CELLS. Can. Jour. Microbiol. 11(1): 9-14. Illus.; Biological Abstracts, Vol. 46, No. 12, Abst. No. 51931. 1965.

The relative growth-stimulating properties of various animal fractions were measured in vitro using a rainbow trout gonadal cell line. No significant differences were noted at the end of a 12 day growth period when 10% of either human serum, bovine serum, or ascitic fluid was added to the basal medium. Ascitic fluid stimulated early growth of the cells but did not result in greater final numbers and apparently caused early degeneration of the cell. Fetal calf serum, bovine embryo extract, and human or bovine serum were required for maximum proliferation of rainbow trout gonadal cells in these experiments. (Authors)

8228. Faust, Samuel D. (Dept. Environ. Sci., Rutgers, State Univ. N.J., New Brunswick, N.J.). 1964. POLLUTION OF THE WATER ENVIRONMENT BY ORGANIC PESTICIDES. Clin Pharmacol. Therap. 5(6 Pt. 1): 677-686; Biological Abstracts, Vol. 46, No. 12, Abst. No. 53708. 1965.

Man is exposed to organic pesticides in his water environment through their use in the control of aquatic weeds, insects, and trash fish; percolation and runoff from agricultural lands; drift from aerial and land applications; and discharge of industrial waste waters. Chemical and biologic evidence indicates that most surface waters of the USA, in general, are polluted with the chlorinated hydrocarbon insecticides. The specific and localized situations, ground and surface waters have been polluted with the herbicide 2, 4-D. These organic pesticides are routed to man through drinking water and indirectly through edible fish. The general evidence suggests that adsorption on solid surfaces, biologic and chemical degradation, hydrolysis, uptake, retention, and release by biologic systems, and chemical precipitation reactions do not eliminate organic pesticides quickly from water. Organic pesticides affect drinking water quality through off-tastes and off-odors. Since the concentrations of several organic thiophosphates and 2, 4-D producing tastes and odors are far below subtoxic levels by factors ranging from 17 to 113, 000, threshold taste and odor levels can be used to establish drinking water standards with the appropriate safety factors. Organic pesticides do not appear to represent a health hazard, chronic or acute, to man at the microgram per liter and milligram per liter concentrations believed to be in ground and surface waters at the present time. (Authors)

8229. Dechtiar, Alex. (Res. Branch, Dept. Lands and Forests, Maple, Ontario, Canada). 1966. A NEW SPECIES OF PHYLLODISTOMUM (TREMATODA: GORGODERIDAE) FROM COREGONUS CLUPEAFORMIS (MITCHILL) FROM LAKE OF THE WOODS (ONTARIO). Canadian Jour. Zoology, 44(1): 135-140.

A new species of gorgoderid trematode, Phyllodistomum coregoni sp. nov., from the ureters and urinary bladder of the lake whitefish is reported and described. The life cycle is unknown.

8230. Thompson, Clark S., and Joseph R. Gauley. (Bur. Commercial Fisheries Fish-Passage Res. Program, Seattle, Wash.). 1965. LABORATORY EVALUATION OF THE 1-ON-10 SLOPE ICE HARBOR FISHWAY DESIGN. U.S. Fish and Wildlife Service Special Scientific Report — Fisheries No. 509. 20 p.

A six-pool, full-scale section of the 1-on10-slope Ice Harbor fishway design was built and tested in the Fisheries-Engineering Research Laboratory at Bonneville Dam before constructing the prototype. Performance of chinook salmon (Oncorhynchus tshawytscha), steelhead trout (Salmo gairdneri), and sockeye salmon (Oncorhynchus nerka) was examined in a series of tests. Results were compared with data from previous tests with a 1-on-16-slope fishway. These comparisons indicate that the new 1-on-10-slope fish way will pass fish as efficiently as the conventional 1-on-16-slope fishway. Several modifications of the original design were examined and minor changes in it recommended. Responses of fish to various flow conditions in the test fishway also were noted and velocity profiles obtained in several typical pools. (Authors)

8231. Nicholson, H. Page, and John R. Thoman. (U.S. Publ. Health Serv., Atlanta, Georgia). 1964. THE PROBLEM OF PESTICIDES AS POLLUTANTS OF WATER. Mosquito News 24(2): 169-172; Biological Abstracts, Vol. 46, No. 12, Abst. No. 53716. 1965.

Pesticides represent only a small fraction of the organic contaminants present in natural waters. They have been selected for particular attention because of their known toxicity and the availability of specific micro-analytical methods. Insecticides recovered from surface waters included: DDT, TDE, toxaphene, dieldrin, endrin, BHC, aldrin, parathion and diazinon. Similarly, herbicides such as fenac, 2, 4-D, and 2, 4, 5-T have also been noted. The documented sources of contamination include: agricultural runoff, spray drift, automotive accidents,

direct dosing of sewage, and industrial wastes. Work by the authors indicate that chronic contamination by toxaphene and BHG (benzene hexachloride) in the low parts per trillion range does not result in gross damage to fish and fish-food organisms. Suggestions are given for control measures which would minimize the quantities of pesticides reaching natural waters. (Authors)

8232. Wolf, Ken (Eastern Fish Disease Laboratory, Kearneysville, W. Va.), Maneth Gravell, and Richard G. Malsberger. 1966. LYMPHOCYSTIS VIRUS: ISOLATION AND PROPAGATION IN CENTRARCHID FISH CELL LINES. Science, Vol. 151, No. 3713, pp. 1004-1005.

A virus from fish with lymphocystis disease was isolated in fish cell cultures. Eleven serial transfers were made and the pathognomonic lymphocystis cells were produced in vitro in each transfer. Fish inoculated with 6th- and 9th-passage material developed the disease, and virus was re-isolated from them.

8233. Goldberg, Erwin (Dept. Biological Sciences, Northwestern Univ., Evanston, Illinois). 1966. LACTATE DEHYDROGENASE OF TROUT: HYBRIDIZATION IN VIVO AND IN VITRO. Science, Vol. 151, No. 3714, pp. 1091-1093.

Speckled trout and lake trout contain five forms of lactate dehydrogenase, but a different electrophoretic distribution of isozymes characterizes each species. The hybrid splake, which is produced artificially by fertilizing lake trout eggs with speckled trout sperm, contains nine isozymes. This complement of isozymes in vivo could be produced in vitro by recombination of subunits from tissues of the parent species. In the splake trout, this complement is the result of heterozygosity at the gene locus responsible for synthesis of LDH-5. Extracts of trout eyes contain at least two additional forms of LDH which could not be demonstrated in other tissues.

8234. Mairs, Donald F. (Maine Dept. Inland Fish. and Game, Dry Mills Hatchery, Gray, Maine). 1966. A TOTAL ALKALINITY ATLAS FOR MAINE LAKE WATERS. Limnology and Oceanography, 11(1): 68-72.

Total alkalinity values collected by personnel of the Maine Department of Inland Fisheries and Game were plotted on an atlas of the state to delineate areas of differing water chemistry. While the vast majority of Maine lakes are very soft, several relatively small hard-water zones are defined. Such zones are considered anomalies and are usually in limestone areas, although incomplete geological knowledge of some parts of the state precludes positive geochemical interpretation of hard-water anomalies in those sections.

8235. Williams, Richard B., and Marianne B. Murdock (Bur. Commercial Fisheries, Radiobiol. Lab., Beaufort, North Carolina). 1966. PHYTOPLANKTON PRODUCTION AND CHLOROPHYLL CONCENTRATION IN THE BEAUFORT CHANNEL, NORTH CAROLINA. Limnology and Oceanography, 11(1): 73-82.

A yearlong study was conducted on phytoplankton at the mouth of a shallow estuary. Photosynthesis had a pronounced seasonal cycle, without major irregularities, that followed the cycle in water temperature. Gross photosynthesis at the surface ranged from 0.12 to 0.72 mg C liter^{-1} day^{-1}. Daily photosynthesis at 50, 25, and 10% of surface illumination averaged 104, 85, and 58% of the surface value. Respiration ranged from 0.01 to 0.29 mg C liter^{-1} day^{-1} and averaged 40% of surface gross photosynthesis. Annual gross production was 113 g C/m2 for a 1.0 m water column (average depth of the estuary) and 225 g C/m^2 for the entire euphotic zone. Annual respiration was 0.39 g C/m^3. This low production was ascribed to shallowness and turbidity. The phytoplankton was chiefly nannoplankton (centric diatoms) and averaged 2 x 10^6 cells/liter. Nannoplankton also contained most of the chlorophyll a and produced most of the respiration and photosynthesis. Chlorophyll a ranged from 2.0 to 9.3 µg/liter, and averaged 3.6 µg/liter from June to October (the period of high water temperatures and high production) and 4.8 µg/liter the remainder of the year. The ratio of photosynthesis to chlorophyll a (at the surface during daylight hours) ranged from 1.9 to 19.8 mg C (mg Chl a)$^{-1}$ hr^{-1} and followed water temperature. Values were predicted by the equation:

$$\log[\text{mg C (mg Chl a)}^{-1}\ \text{hr}^{-1}] = 0.138 + 0.0353 \times \text{temperature (°C)},$$

yielding a Q_{10} of 2.25 for the ratio of photosynthesis to chlorophyll a.

8236. Williams, Louis G. (U.S. Public Health Service, R.A. Taft Sanitary Engineering Center, Cincinnati, Ohio). 1966. DOMINANT PLANKTONIC ROTIFERS OF MAJOR WATERWAYS OF THE UNITED STATES. Limnology and Oceanography, 11(1): 83-91.

Rotifers were the most numerous metazoans found in preserved plankton samples taken routinely at 128 sampling stations on the major rivers and Great Lakes of the United States. While rotifers of more than one genus often dominated a sample, the dominant form tended to be one species. Generally, stations with high population densities had low species diversity. Turbulence, silt, and some other edaphic factors appeared to be more important than industrial or domestic wastes, during winter and early spring, in reducing the number of species of rotifers in the biota. During the summer and fall, differences in the abundances of dominant species appeared to be the best criterion for indicating differences in water quality or pollution.

8237. Applegate, Richard L. (South Central Reservoir Investigations, Bur. Sport Fisheries and Wildlife, Fayetteville, Arkansas). 1966. THE USE OF A BRYOZOAN, FREDERICELLA SULTANA, AS FOOD BY SUNFISH IN BULL SHOALS RESERVOIR. Limnology and Oceanography, 11(1): 129-130.

8238. Becker, Clarence D., and Max Katz. (Coll. Fish., Univ. Wash., Seattle, Wash.). 1965. TRANSMISSION OF THE HEMOFLAGELLATE,

CRYPTOBIA SALMOSITICA KATZ, 1951, BY A RHYNCHOBDELLID VECTOR. Jour. Parasitol., 51(1): 95-99; Biological Abstracts, Vol. 46, No. 12, Abst. No. 54635. 1965.

The transmission of Cryptobia salmositica Katz, 1951, a hemoflagellate of freshwater teleosts, was investigated in experiments involving the rhynchobdellid leech, Piscicola salmositica Meyer, 1946. Uninfected leeches developed metacyclic stages of Cryptobia in their digestive tracts after feeding on naturally infected torrent sculpins (Cottus rhotheus). When naturally infected leeches were fasted and then allowed to engorge on uninfected juvenile coho salmon (Oncorhunchus kistutch) and torrent sculpins, parasitemias developed in the fish as early as 5 days after the leeches had fed. Infections did not appear in uninfected fish after ingesting infected leeches, nor in uninfected leeches after feeding on the blood of uninfected fish. C. lynchi Katz, 1951, is declared a synonym of C. salmositica. (Authors)

8239. Aleev, Yu. G. 1963. THE BUOYANCY OF FISHES. (O PLAVUCHESTI RYB). Tr Sevastopol' skoi Biol Sta Akad Nauk Ukr RSR 16: 375-382. From: Ref Zh Biol., 1964, No. 20I62. (Translation); Biological Abstracts, Vol. 46, No. 13, Abst. No. 59520. 1965.

By buoyancy of a fish is meant the difference between the specific gravity of the fish and the specific gravity of the water in which the has been caught. The specific gravity of 10 specimens has been determined from the weight and volume with an accuracy of 0.01. A table of buoyancies of various spp. of fish is presented. The buoyancy varies from sp. to sp., and differs substantially among individuals of different lengths (age), as well as seasonally. Pelagic and demersal-pelagic forms which spend a considerable part of time floating in water, both saline and fresh, have a neutral or almost neutral buoyancy, i.e., their buoyancy equals zero. This is achieved through the fish's swim-bladder or through its fat content (Squalus, Scomber and others). There are, however, forms with a markedly negative buoyancy (-0.07 in Sarda sarda); all these forms show a distinct tendency toward vertical migration, a fact which is connected with the absence of a swim-bladder. In demersal fishes the buoyancy varies according to the type of organs that enable the fish to stay in one place (suckers and other organs). The stronger the current (surf, high tide, low water, tidal currents) the lower the buoyancy (Proterorhinus, Gobius). Variation of buoyancy with age has been observed in a number of sp. Seasonal changes in buoyancy are connected with the seasonal differences in fat content. Seasonal changes were found to occur to a considerable extent in fishes lacking a swim-bladder (Scomber, Ammodytes).

8240. Flittner, Glenn A. (Biol. Lab., U.S. Bur. Commercial Fisheries, San Diego, Calif.). 1964. REVIEW OF THE MOVEMENT OF ALBACORE TUNA OFF THE PACIFIC COAST IN 1963. Commercial Fisheries Review, 26(12): 13-19. Illus. Maps.

Troll catches by U.S. Navy radar picket vessels monitoring fixed, continuously-manned stations off the Pacific coast revealed the seasonal movement of albacore tuna (Thunnus alalunga Bonnaterre) in 1963. Inshore and northward migration of albacore in relation to sea surface temperatures is reviewed. Onset, termination of fishing at each station, and similarity of movement to the schematic migration model presented last year for 1962 is examined. (Auth.)

8241. Guitart-Manday, Dario. 1964. FISHERIES BIOLOGY OF THE SWORDFISH, XIPHIAS GLADIUS LINNAEUS (TELEOSTOMI: XIPHIIDAE) IN CUBAN WATERS. (BIOLOGI PESQUERA DEL EMPERADOR O PEZ DE ESPADA, XIPHIAS GLADIUS LINNAEUS (TELEOSTOMI: XIPHIIDAE) EN LAS AGUAS DE CUBA). Poeyana Ser B 1. 1-37. Illus. Maps; (Eng. summ.); Biological Abstracts, 46(13): Abst. No. 55633. 1965.

Research on the biology of the swordfish (Xiphias gladius L.) was conducted off the Northwestern coast of Cuba during 1961-1963 in connection with the development of commercial fisheries and gear improvement. Significant information was gathered on post-embryonic development, feeding habits and parasites of the species, and adequate samples of its population were statistically analyzed regarding size, sex, length-weight, K factor, vertical distribution and migration. Results are thoroughly discussed and relevant conclusions are drawn. On the basis of the biological data obtained and the research done on experimental and exploratory fisheries, the author designed a new and more effective fishing gear and proposes an extention of the present fishing area. (Auth.)

8242. Ioff, N. A. 1964. STIMULATION OF THE MINNOW REPRODUCTIVE CYCLE. (STIMULYATSIYA POLOVOGO TSIKLA U GOL'YANA). In: Problemy sovremennoi embriologii. (Problems of present-day embryology). Moscow Univ.: Moscow. 301-303. From: Ref Zh Biol., 1964, No. 21I63. (Translation); Biological Abstracts, Vol. 46, No. 13, Abst. No. 56571. 1965.

Observations are presented on the effect of temperature fluctuation on the minnow reproductive cycle. Periodic cooling of the water accompanied by sharp temperature fluctuations followed by sharply rising temperatures were found to stimulate the development of the fish's gonads.

8243. Shelbourne, J. E. (Fish. Lab., Lowestoft, England). 1964. THE ARTIFICIAL PROPAGATION OF MARINE FISH. Advance Mar. Biol. 2: 1-83. Illus.; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60349. 1965.

The purpose of this paper is to sketch in the history of the marine fish hatchery movement from its origins to the present day; to review some of the arguments for and against the practical value of sea-fish hatching; to describe recent advances in the technique of marine fish rearing; and finally to comment on possible future developments in the direction of marine fish farming. (From auth.)

8244. Siefert, Richard E. (North Central Reservoir Invest., Yankton, S.D.). 1965. EARLY SCALE DEVELOPMENT IN THE WHITE CRAPPIE. Trans. Amer. Fish. Soc. 94(2): 182.; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60350. 1965.

Scale formation on white crappies (Pomoxis annularis Rafinesque) from Lewis and Clark Lake, a mainstem Missouri River reservoir, first occurred in the 16-19 mm length range. Initial scale pockets appeared on the caudal peduncle and were formed progressively anterior and ventral to the lateral line with the growth of the fish. Imbrication of scales began on fish 22 to 24 mm long, with the first fully scaled fish observed at 27 mm. (Auth.)

8245. Davis, R. E. (Ment. Health Res. Inst., Univ. Mich., Ann Arbor, Mich.). 1964. DAILY "PREDAWN" PEAK OF LOCOMOTION IN FISH. Animal Behavior, XII(2/3): 272-283. Illus.; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60107. 1965.

Bluegills (Lepomis m. macrochirus) and largemouth bass (Micropterus salmoides) held under alternating, 12-hr. periods of light and "darkness" (very dim light) and fed daily at the onset of light showed in 10 to 20 days a 1 - 3 hr. peak of locomotion at the end of the daily "dark" period. Activity was automatically recorded for 160 days. Experimental alterations of the periodicities of light and feeding indicated that the timing of the peak was co-ordinated by the daily change from "dark" to light and not the light-to-dark change of feeding time. A peak of locomotion corresponding to the predawn peak persisted for 2 days in constant "darkness" without feeding. It is proposed that the predawn peak is regulated from within the fish by an internal rhythm which itself is co-ordinated by the light-"dark" cycle. (Auth.)

8246. Bocharov, G. D. 1964. ADAPTATION OF PINK AND CHUM SALMON TO SEA WATER. (MATERIALY PO PRISPOSOBLYAEMOSTI MOLODI GORBUSHI I KETY K MORSKOI VODE). Tr Murmanskogo Morsk Biol Inst 5,9 154-160. From: Ref. Zh. Biol., 1964, No. 16I52. (Translation); Biological Abstracts, Vol. 46, No. 14, Abst. No. 60277. 1965.

Juveniles in different developmental stages (free embryos, larvae and smolt) were transferred from fresh to sea water of varying salinity. The controls remained in fresh-water. The fishes' readiness for osmoregulation was characterized by the survival of the young. Pink and chum salmon embryos successfully survived a 15% sudden rise in salinity, whereas at 25% many of them died. Larvae of both species easily tolerated 25%. At 30 to 35%, the survival rate of larval chum was lower than that of larval pink salmon. A high survival in sea water with a salinity of 35% was achieved after adaptation of predownstream-migrant young to a solution with 15% salinity and 25% in the course of 3 to 7 days. Because of the better osmoregulatory adaptation of downstream-migrant young, their survival rate at 40% salinity was uniformly higher than that of young in earlier stages of development. No change in osmoregulatory adaptation to sea water was observed in young fish that were kept in fresh-water 2 to 7 months after the downstream migration period.

8247. Burmakin, E. V. 1963. A CHEMICAL METHOD FOR RENDERING LAKES SUITABLE FOR FISH CULTURE (PRELIMINARY RESULTS AND PERSPECTIVES). (KHIMICHESKII METOD RYBOKHOZYAISTVENNOGO PREOBRAZOVANIYA OZER (PREDVARITEL'NYE REZUL'TATY I PERSPEKTIVY)). Izv Gos Nauch-Issled Inst Ozern Rechn Rybn Khoz 55: 7-17. (Eng. summ.). From: Ref. Zh. Biol., 1964, No. 18I64. (Translation); Biological Abstracts, Vol. 46, No. 14, Abst. No. 60280. 1965.

Coarse fishes in USSR lakes are exterminated by means of polychlorpinene in concentrations of 0.05 to 0.2 mg/l. The greatest susceptibility to the action of polychlorpinene is shown by juvenile fish and by adult ruffe, perch, and pike. Invertebrates, particularly worms and leeches, are less sensitive to the effects of the poison. It is essential that introduction of fish into lakes be preceded by a period of detoxication lasting 1 or 1-1/2 years. By the end of 1962 as many as 59 lakes with a total area of 1600 ha were cleared of coarse fish by the use of polychlorpinene. In 1962 fish were cultivated in 10 lakes (128 ha).

8248. Hansen, Donald F. (Natur. Hist. Surv., Urbana, Ill.). 1965. FURTHER OBSERVATIONS ON NESTING OF THE WHITE CRAPPIE, POMOXIS ANNULARIS. Trans. Amer. Fish. Soc., 94(2): 182-184; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60300. 1965.

The rarely observed nests of the white crappie were seen in large numbers at Lake of the Woods near Urbana, Illinois, between May 21 and June 10, 1956. Attempts to find the nests in the same lake in later years were quite unsuccessful. Most of the nests were built on hard clay, sometimes in beds of rooted plants, sometimes not. Preparations of the nest site included partial clearing away of plant stems (if present), followed by sweeping away of the thin layer of sediment. In no case was there a visible nest depression. Plant materials were always present in the floor of the nest or they surrounded the nest. The plants included Elodea and filamentous algae, and both were used for egg attachment. Nests were 1-1/2 feet to 4 feet apart in water up to 5 feet deep, and formed both linear and circular colonies. Solitary nesting was uncommon. Some colonies occupied the flat bottom; other colonies occupied steep slopes. The nesting fish were so tame that they could be watched for several minutes at a time from distances of only 2 or 3 feet. (Auth.)

8249. Heard, William R. (Bur. Commercial Fisheries, Biol. Lab., Auke Bay, Alaska). 1965. LIMNETIC COTTID LARVAE AND THEIR UTILIZATION AS FOOD BY JUVENILE SOCKEYE SALMON. Trans. Amer. Fish. Soc., 94(2): 191-193.; Biological

Abstracts, Vol. 46, No. 14, Abst. No. 60303. 1965.

Larval cottids were found in stomach contents of juvenile sockeye salmon (Oncorhynchus nerka) caught in open-water areas of Brooks Lake on the Alaska Peninsula. Although freshwater cottids are usually benthic fishes, this suggested that the larvae might be planktonic. Subsequent capture of Cottus aleuticus larvae 8 to 13 mm in total length taken at midlake over deep water confirmed that larvae of this species are at times planktonic. The larvae were caught in a conical net towed near the lake surface. Other accounts of juvenile sockeye salmon eating cottid larvae and the more common situation, that of cottids earing salmon eggs, alevins, and fry, are also reviewed. (Auth.)

8250. Houser, Alfred (Okla. Fish. Res. Lab., Norman, Okla.). 1963. LOSS IN WEIGHT OF SUNFISH FOLLOWING AQUATIC VEGETATION CONTROL USING THE HERBICIDE SILVEX. In: Fifty-first Annual Meeting of the Oklahoma Acad. of Science, Tulsa, Okla., 7-8 December, 1962. Proc. Oklahoma Acad. Sci., 43: 232-237; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60305. 1965.

Three species of fishes in two ponds experienced a loss in weight during the 2 years following the application of Silvex to control aquatic vegetation. The likelihood that the loss in weight was related indirectly to the destruction of weed beds or that it may have resulted more directly from toxicity of the herbicide is discussed. (Auth.)

8251. Hunt, Robert L. (Wis. Conserv. Dept., Madison, Wis.). 1965. DISPERSAL OF WILD BROOK TROUT DURING THEIR FIRST SUMMER OF LIFE. Trans. Amer. Fish. Soc., 94(2): 186-188. Illus.; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60307. 1965.

In June of 1959-63 permanent marks were applied to 50-61% of 5 year-classes of wild brook trout (Salvelinus fontinalis) in 3.5 mile long, 12-acre Lawrence creek. Different marks were used in at least 3 of 4 stream sections each summer. Dispersal across section boundaries was determined from subsequent recaptures of marked age-group 0 brook trout during annual September population estimates. Dispersal of 6-9 month-old fingerlings was directly correlated with their density. By mid-Sept., 10% of the surviving fingerlings had emigrated from their section of origin when their density in June was 548 per acre, and 36% had emigrated when their density in June was 6,323 per acre. (Auth.)

8252. Jackson, Sam Jr. (Okla. Dept. Wildlife Conserv., Okla. City, Okla.). 1963. SUMMARY OF RETURNED TAGGED FISHES FROM RECREATION LAKE, MOHAWK PARK, TULSA, OKLAHOMA, APRIL 29 TO SEPTEMBER 5, 1960. In: Fifty-first Annual Meeting of the Oklahoma Academy of Science, Tulsa, Oklahoma, 7-8 December, 1962. Proc. Oklahoma Acad. Sci., 43: 238-239; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60313. 1965.

One thousand and four fish, comprised of 5 species, largemouth bass, white crappie, channel catfish, white bass, and bluegill, were tagged with barbed plastic tags and released in a 75-acre lake. Heavy fishing pressure over the 128-day project period accounted for tag returns of 51.1% on largemouth bass, 45.9% on white crappie, 28.8% on channel catfish, 24.3% on white bass, and 37.9% on bluegill. Twelve thousand dollars in cash awards provided added incentive and probably accounts for the high percentage of returned tags. (Auth.)

8253. Khairulina, E. N. 1963. THE CULTURE OF FISH FOR STOCKING IN FERTILIZED AND HARROWED PONDS. (VYRASHCHIVANIE RYBOPOSADOCHNOGO MATERIALA NA VYRABOTANNYKH FREZERNYKH POLYAKH S PRIMENENIEM AGROMELIORATIVNYKH I INTENSIFIKATSIONNYKH MEROPRIYATII). Tr. Vses. Nauch-Issled Inst Prudovogo Rybn Khoz 12: 25-34. From: Ref Zh Biol, 1964. No. 18I76. (Translation); Biological Abstracts, Vol. 46, No. 14, Abst. No. 60319. 1965.

This paper discusses the effects of fertilizers (organo-mineral mixtures, ammonium nitrate, superphosphate) and of harrowing on the fish productivity of ponds. Fertilized ponds were characterized by large amounts of dissolved organic matter and biogeneous elements. Harrowing of pond-beds has resulted in a higher rate of mineralization. The abundance of biogens in fertilized ponds ensured better nutrient qualities in the links of all food chains. In fertilized ponds fish production rose by 2.3-3.3 metric centners per hectare while food expenditures dropped 22.36%. As a result of these measures, the yield of carp fingerlings rose to 5-6 centners/ha.

8254. Momot, Walter. (Dept. Zool. Entomol., Ohio State Univ., Columbus, Ohio). 1965. FOOD HABITS OF THE BROOK TROUT IN WEST LOST LAKE. Trans. Amer. Fish. Soc., 94(2): 189-190.; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60330. 1965.

The study covered the variations in the food habits of the brook trout, Salvelinus fontinalis, in a pot hole lake as influenced by shifts in the increasing size and age of the fish and changes in the abundance of some of the food items in the lake. During the fishing season stomachs of angler-caught fish were examined. During the rest of the year fish were collected by hook and line or with an A.C. shocker. The trout population can be divided into two ecological categories each having a different pattern with respect to its predation upon and utilization of the food available in the lake. The approximate point of division of these two categories is at a mean length of 8 inches. Small fish 5-to-8 inches long fed predominantly on cladocerans during the winter and on insects in the spring and summer and crayfish in the fall and winter. Considering categories of major food items, most of the crayfish were eaten by large trout, most of the insects by medium-size trout, cladocerans by small trout. (Auth.)

8255. Privol'nev, T.I., S.V. Strel'tsova, P.N. Brizinova, I.N. Ostroumova, and N.V. Koroleva. (State Lake and River Fish Ind. Res. Inst., Leningrad, USSR). 1964. PROTECTION OF THE RAINBOW TROUT (SALMO IRIDEUS GIBB) AGAINST

LIPOID DEGENERATION OF THE LIVER BY THE INTRODUCTION OF PHOSPHATIDES INTO ITS DIET. (PREDOKHRANENIE OT LIPOIDNOI DEGENERATSII PECHENI RADUZHNOI FORELI VVEDENIEM V RATSION FOSFATIDOV). Dokl Akad Nauk SSSR 156(5): 1241-1243. Illus.; Biological Abstracts, Vol. 46, No. 14, Abst. No. 60743. 1965.

Rainbow trout 1 year in age (3 groups of 1000), 2 years (3 groups of 300) and 3 years (3 groups of 30) were studied. Group I received a ration of 60% by weight of sprats; meat-bone meal, 15%; mixed feed, 25%; Group II, 60% sprats, 15% meat-bone meal, mixed feed 20%, phosphatides 5%; and Group III received 60% sprats, 15% meat-bone meal, 15% mixed feed, and 10% phosphatides. The phosphatides consisted of a "lecithin" concentrate of sunflower origin which was crude and edible. The fish were fed for 4 months from the middle of June to the middle of October. The addition to the feed mixture of the "lecithin" sunflower phosphatide concentrate protected the rainbow trout against lipoid degeneration when it was fed with frozen Caspian sprats. The feeding to trout of sprats and the introduction of phosphatides into the ration induces maximal changes in the liver, blood indexes, and general state in fish of the youngest ages, 1 and 2 years. For the younger fish, a 5% phosphatide content induces less difference, than one of 10%. With 3-year-old fish, there were no appreciable differences between those on a 5% and 10% phosphatide diet. --D. Franklin.

8256. Sanders, Bob G. (Dept. Biol., Lafayette Coll., Easton, Penn.). 1964. ELECTROPHORETIC STUDIES OF SERUM PROTEINS OF 3 TROUT SPECIES AND THE RESULTING HYBRIDS WITHIN THE FAMILY SALMONIDAE. In: C. A. Leone, Editor. Taxonomic Biochemistry and Serology. The Ronald Press Company: New York 10. p. 673-679. Illus.; Biological Abstracts, Vol. 46, No. 14, Abst. No. 64099. 1965.

A comparative study of the blood serum of brown trout (Salmo trutta), brook trout (Salvelinus fontinalis), rainbow trout (Salmo gairdneri), and resulting hybrid specimens (tiger trout and brownbow trout) were analyzed electrophoretically for protein components, and the percentage of proteins in each fraction was determined. Fourteen samples of brown trout, 10 of brook trout, 21 of rainbow trout, 10 of tiger trout and 1 of brownbow trout sera were studied. Characteristic protein fractions for the particular spp. of trout studied were obtained, with the exception of rainbow trout. Rainbow trout sera exhibited either 6 or 7 protein fractions. Brown and brook trout sera differed in the number of protein fractions; 7 major fractions were found in brown trout sera, and 6 major fractions were found in brook trout sera. They further differed in the final mobilities, brown trout sera migrating 126 mm and brook trout sera 105 mm. The mobilities for fractions 1, 2, and 3 were similar for brook and brown trout sera. The 2 hybrid spp. gave electrophoretic patterns characteristic of one of the parental types. The patterns of the tiger trout hybrid sera differed from those of the brook trout, but were very similar to the patterns obtained with brown trout sera. Seven fractions were obtained in the tiger trout sera, and the mobilities of these were similar to those obtained with brown trout serum. Brownbow trout sera had 6 fractions, and were similar to rainbow trout 2 but different from rainbow trout 1 and brown trout. Interspecific and intraspecific differences in the amount of protein occurred. Preliminary studies suggest that the amount of protein present varied with age, sex, species, and diet. Diet may be a major contributing factor in altering the amount of total protein. (Auth.)

8257. Ali, M. A. (Dept. Biol., Univ. Montreal, Montreal, Quebec, Canada). 1964. DIURNAL RHYTHM IN THE RATES OF OXYGEN CONSUMPTION, LOCOMOTOR AND FEEDING ACTIVITY OF YEARLING ATLANTIC SALMON (SALMO SALAR) UNDER VARIOUS LIGHT CONDITIONS. Proc. Indian Acad Sci Sect B 60(4): 249-263. Illus.; Biological Abstracts, Vol. 46, No. 15, Abst. No. 64666. 1965.

Under control conditions of the laboratory, the rates of oxygen consumption, locomotor activity and feeding show a diurnal rhythm. It appears that light plays only a minor role in the production of this rhythm in the juvenile Atlantic salmon. (Auth.)

8258. Heard, William R. (Bur. Commercial Fish. Biol. Lab., Auke Bay, Alaska). 1964. PHOTOTACTIC BEHAVIOR OF EMERGING SOCKEYE SALMON FRY. Animal Behavior XII(2/3): 382-388. Illus.; Biological Abstracts, Vol. 46, No. 15, Abst. No. 64674. 1965.

Emergence of sockeye salmon fry (Oncorhynchus nerka) from natal gravels was essentially nocturnal, although 15.9% of the fry caught in the control halves of experimental traps emerged during daylight. When gravel was exposed to artificial light at night, nocturnal emergence was reduced, daylight emergence was accelerated, and the overall rate of emergence was retarded. When the artificial light was removed nocturnal emergence increased. The minimum duration of emergence from twelve sq. ft. areas of gravel ranged from 37 to 48 days and averaged 41 days. The behavior of emergent and downstream migrant fry is discussed. (Auth.)

8259. Bakshtanskii, E. L. 1964. THE INFLUENCE OF PREDATORS ON THE YOUNG OF PINK SALMON, ONCORHYNCHUS GORBUSCHA (WALB.) AND CHUM SALMON, ONCORHYNCHUS KETA (WALB.) IN THE WHITE AND BARENTS SEAS. (VOZDEISTVIE KHISHCHNIKOV NA MOLOD' GORBUSHCHI ONCORHYNCHUS GORBUSCHA (WALB.) I KETY ONCORHYNCHUS KETA (WALB.) V BELOM I BARENTSEVOM MORYAKH). Vop Ikhtiol 4(1): 136-141. Illus.; Biological Abstracts, Vol. 46, No. 15, Abst. No. 64790. 1965.

Observations on the influence of predators on larvae released from the Umba and Knyazha hatcheries were carried out along the northern coast of the Kola Peninsula (Barents Sea) in 1956-60, and along its

southern coast (White Sea) in 1960-61. The larvae were found to be preyed upon by sea trout (Salmo trutta), Atlantic salmon smolts (Salmo salar), sticklebacks (Gasterosteus aculeatus), herring and young gadoids. Predation by young gadoids caused heavy losses to the young of chum salmon in Barents Sea bays. For this reason the author recommends that the acclimatization of chum salmon be transferred from the Barents to the White Sea fish hatcheries. --D. M. Cutler.

8260. Bocharov, G. D. 1963. CHANGE IN THE SELECTIVE REACTION OF PINK SALMON (ONCORHYNCHUS GORBUSCHA WALB.) TO SEA WATER. (OB IZMENCHIVOSTI IZBIRATEL'NOI REAKTSII NA MORSKUYU VODU U GORBUSHI (ONCORHYNCHUS GORBUSCHA WALB.)). Tr. Polyarnogo Nauch-Issled Proektn Inst Morsk Rybn Khoz Okeanogr 15. 49-55. From: Ref Zh Biol, 1964, No. 15151. (Translation); Biological Abstracts, Vol. 46, No. 15, Abst. No. 64793. 1965.

Experiments were conducted in a flow-type aquarium. Series A experiments were carried out with 8- to 9-month-old individuals which were kept 5 months in fresh water. The temperature of this water differed from that of sea water by 0.3 to 2.1° C. and the O_2 content by 10-15%. Series B experiments were conducted with 11- to 12-month-old individuals that were kept in fresh water for a period of 7 months. The temperature gradient in the aquarium was 0.1 - 5.4 °C; O_2 content 9-17%. The salinity gradient was kept at 30-33 o/oo in both series; pH of the freshwater was 6.4 - 6.7, that of the sea water 8.1 - 8.2. From the time the young fish attained the silvery stage they were held in peaty lake under natural light conditions. They were held in peaty lake under natural light conditions. They were then transferred to a fresh water aquarium and kept there under artificial illumination -- series A for a 4-day period, series B for a 2.5-month period. Series B fish were noticeably exhausted and died in considerable numbers. No preference for sea water was observed in 8 out of 10 series-A fish during a 10-hr period, although a positive reaction occurred when the fish were placed in a small, weakly saline (5-9 o/oo) layer of fresh water. A preference for sea water was observed in series B fish. Unless the environmental conditions were rendered extremely unfavorable (by lowering the temperature and O_2 content) fish that had been transferred to sea water showed great reluctance to return to fresh water.

8261. Schwartz, Frank (Nat. Res. Inst. Univ. Maryland, College Park, Md.). 1964. SEVERAL MARYLAND FISHES ARE CLOSE TO EXTINCTION. Maryland Conserv. 41(3): 8-12. Illus.; Biological Abstracts, Vol. 46, No. 15, Abst. No. 64823. 1965.

Pollution, sedimentation and drainage have drastically reduced numbers of 17 freshwater and marine species. (Auth.)

8262. Tets, V. I. (State Res. Inst. Lake River Fish. Manage., Leningrad, USSR). 1964. SOME SPECIFIC CHARACTERISTICS OF THE IMMUNOLOGICAL REACTIONS OF FISH. (NEKOTORYE OSOBENNOSTI IMMUNOLOGICHESKOI REAKTIVNOSTI RYB). Dokl Akad Nauk SSSR 159(1): 227-229; Biological Abstracts, Vol. 46, No. 15, Abst. No. 67057. 1965.

One-year-old carp received repeated injections of an Aeromonas punctata vaccine prepared by heating a suspension of these bacteria for 1 hour at 60° and preserved by adding 0.5% formalin. As shown by agglutination tests and a Coombs test, the carp did not develop antibodies, while frogs used as controls developed specific agglutinins. However, carp injected with the vaccine developed increasing tolerance to live cultures of A. punctata. The tolerance was unspecific and was exhibited towards a strain of A. punctata with a different antigenic structure as well. Trout 2 years old and perch 3 - 5 years old exhibited an unspecific agglutination reaction with respect to A. punctata on being injected with the vaccine. In experiments on trout and carp 3 years old, a part of the fish received injections of a suspension of strain No. 36, of A. punctata, a control group was given injections of ram erythrocytes, and another control group did not receive any injections. As compared with controls of the last group, both fish injected with the suspension of bacteria and fish injected with erythrocytes developed an unspecific agglutination reaction with respect to A. punctata strains. The serum of fish injected with ram erythrocytes produced a slight coagulation of these erythrocytes in a dilution of 1:20, but did not sensitize the erythrocytes to guinea pig complement. Parallel experiments, in which the hemolytic activity of carp and trout sera towards ram erythrocytes sensitized with a specific hemolytic amboceptor and ram erythrocytes that had not been sensitized was determined, showed that the action of the sera was the same in both cases: either both sensitized and unsensitized erythrocytes were hemolyzed, or they were not hemolyzed. This indicated that hemolysis was produced by normal fish hemotoxin and that the conclusion of V. I. Luk'yanenko and E. K. Mieserova (Dokl Akad Nauk SSSR 146(4). 1962) in regard to the presence of complement in fish sera on the basis of experiments in which control tests with unsensitized erythrocytes were not carried out was mistaken. --L. M. Blumenthal.

8263. Benedict, Nelson. 1966. NEW THREAT TO ATLANTIC SALMON. Sportfishing, 2(7): 18-19, 46.

It appears that there is a general movement of Atlantic salmon to feeding grounds near the coast of Greenland. Recent heavy commercial catches here included fish tagged in the countries of northern Europe, Canada, and Maine. Most of the catch is taken from the territorial waters of Greenland and therefore not subject to regulating treaties. A continuing, and probably expanding, commercial take of salmon from this north Atlantic area could have a significant effect upon the numbers of salmon in the streams of both Europe and North America.

8264. Cairns, John Jr., Arthur Scheier, and Jules J. Loos (Dept. Limnology, Acad. Natural Sci. of Philadelphia, Philadelphia, Pa.). 1965. A COM-

PARISON OF THE SENSITIVITY TO CERTAIN CHEMICALS OF ADULT ZEBRA DANIOS BRACHYDANIO RERIO (HAMILTON-BUCHANAN) AND ZEBRA DANIO EGGS WITH THAT OF ADULT BLUEGILL SUNFISH LEPOMIS MACROCHIRUS RAF. Notulae Naturae (Acad. Natur. Sci., Philadelphia, Pa.), No. 381. 9 p.

Tests were carried out with zinc chloride, potassium cyanide, naphthenic acids, potassium dichromate, and a detergent. The results of these experiments indicate that one may not assume that different species or even different stages in the life cycle of a single species will have the same realtive response to different toxic materials. Any measurements which define the toxic nature of a material must encompass species differences and changes in sensitivity during the life cycle of a species. (Authors)

8265. Halver, John E. (Western Fish Nutrition Lab., Bur. Sport Fish. & Wildlife, Cook, Wash.). 1965. AFLATOXICOSIS AND RAINBOW TROUT HEPATOMA. Mycotoxins in Foodstuffs, Gerald N. Wogan, ed., M.I.T. Press. p. 209-234.

Rainbow trout fed appropriate levels of 11 chemical carcinogens incorporated into a negative control test ration developed typical adenomatous, trabecular, or mixed-pattern hepatoma. Occasionally a cholangioma was also observed. Fat carefully extracted from the commercial ration and fed as part of the diet to young trout for one year also appeared as a vector in hepatomagenesis. High load tests with crude aflatoxin concentrates showed massive liver damage and multiple hemorrhagic areas throughout the liver, caeca, and other viscera of small trout in a single-dose, 10-day test. Considerable typical liver damage could be observed when only 0.2 mg of the crystalline aflatoxins per kg body weight were administered. In a long-term feeding study crude and crystalline aflatoxins B_1 and G_1 extracted, separated, and purified from contaminated peanuts or cultured on wheat showed a very high incidence of primary liver cell carcinoma in trout fed only ppb of diet of these compounds for 6 months to 1 year. Further current investigations in many laboratories should extent and define the effects of aflatoxicosis in rainbow trout hepatomagenesis. (Auth. summ.)

8266. Amend, D.F., J.L. Fryer, and K.S. Pilcher. (U.S. Fish & Wildlife Service, Seattle, Wash.). 1965. PRODUCTION TRIALS UTILIZING SULFONAMIDE DRUGS FOR THE CONTROL OF "COLD-WATER" DISEASE IN JUVENILE COHO SALMON. Research Briefs, Fish Comm. of Oregon, 11(1): 14-17.

"Cold-water" or peduncle disease caused by Cytophage paychrophila is one of the most serious diseases presently encountered by juvenile coho salmon (Oncorhynchus kisutch) in Oregon hatcheries. Sulmet (sulfamethazine) has been used prophylactically and therapeutically for control of this disease, but was not always satisfactory. An experiment was conducted to compare the effectiveness of two newer sulfonamides, Gantrisin (sulfisoxazole) and S.E.Z. (sulfaethoxypyridazine). Treatment with each of the drugs reduced the loss of juveniles, with Gantrisin and S.E.Z. appearing to control the disease more quickly than Sulmet. A continuous 4-g. per 100 lbs. of fish per day controlled the disease as well as an alternating 10-2-10 g. treatment and required smaller amounts of drugs.

8267. Galbreath, J.L. (Fish Comm. of Oregon, Clackamas, Oreg.). 1965. TIMING OF WILLAMETTE RIVER SPRING CHINOOK SALMON THROUGH THE LOWER COLUMBIA RIVER. Research Briefs, Fish Comm. of Oregon, 11(1): 29-41.

Recoveries of tagged and marked fish and period of peak sport catches were used to supplement earlier information on timing of adult Willamette River spring chinook (Oncorhynchus tshawytscha). Tagging was conducted from 1948-63 by the Washington Department of Fisheries and Oregon Fish Commission. Recoveries indicated that the major portion of the Willamette run is present in the lower Columbia River in March and early April. Finclipped spring chinook were released into the middle Willamette River from brood years 1946-58. Mark recoveries were obtained from commercial and sport fisheries and hatchery returns. These recoveries indicated that Willamette stocks pass through the lower Columbia River from February-May with a suggestion of earlier timing than most other components of the Columbia River spring run. Sport catch data from 1946-63 showed fish caught from February-June, with peak catches in April. Results from these three sources may be modified to an unknown extent by the commercial gill-net fishery. However, data in this report indicated that the majority of Willamette spring chinook migrate through the lower Columbia during late March and early April.

8268. Demory, R.L. (Fish Comm. of Oregon, Astoria, Oreg.). 1965. LENGTH-WEIGHT RELATIONSHIPS OF COLUMBIA RIVER CHINOOK SALMON. Research Brief, Fish Comm. of Oregon, 11(1): 18-24.

Length-weight relationships of Columbia River chinook salmon (Oncorhynchus tshawytscha) were determined by the formula $\text{Log } W = a+b \text{ Log } L$, where W = weight and L = length. Constants a and b were determined by least squares. Regression coefficients were tested for homogeneity by analysis of covariance at the 5% significance level. Data were stratified by year, season, and zone of catch. Significant differences were found between years and between fishing seasons. No significant difference was found between zones in a season, but when data were pooled a significant difference was found. A single length-weight sample from any year from one of several seasons or zones is not representative of all Columbia River chinook. For reliability, length-weight samples should be stratified by year, season, and probably zone in a season. If pooling of data is necessary, the first consideration should be pooling by zone within a season.

8269. Trueblood, Ted and Ed Zern. 1966. THE BIG TROUT CONTROVERSY. Field and Stream, 70(12): 68, 69, 82, 84-88, 90, 91.

The controversy concerns the desirability of establishing more areas for fishing with flies only. Mr. Trueblood does not believe the use of flies only would improve the fishing. He emphasizes the need to preserve and improve the existing fish habitat. He recommends that all stocking of quality trout waters be stopped, except lakes where there is no natural reproductions. He also recommends that the harvest of good trout waters be limited to the productive capabilities of those particular waters, by increasing the minimum size, reducing the legal take or whatever is needed to prevent anglers from taking the good trout faster than they can be produced in the stream. Streams incapable of producing good fish could be managed for put-and-take fishing. Mr. Zern advocates the use of flies as he thinks using them requires more skill. He admits that a good fly-fisherman can often take more fish than the average bait- or lure-fisherman, but thinks that the use of flies-only will tend to preserve the sporting phase of trout fishing and screen out the fishermen primarily interested in dead fish in the creel. There are many things the two authors hold in common: need for good habitat, advantages of naturally propagated fish, limiting the harvest to the capacity of good waters to produce, and the sport of fishing rather than the number and poundage of fish taken. The "controversy" may well stimulate others, both scientists and sportsmen, to "take pen in hand".

8270. Gulland, J.A. (Fisheries Lab., Lowestoft, England). 1965. MANUAL OF METHODS FOR FISH STOCK ASSESSMENT. PART I. FISH POPULATION ANALYSIS. FAO Fisheries Technical Paper No. 40, Revision 1. 68 p.

A revision of the provisional edition of the manual put out in 1964. It furnishes an account of purposes and methods of estimation of parameters and assessment in fish population analysis. Examples demonstrate application of methods.

8271. Taylor, V.R. (Fish Culture Develop. Branch, Dept. of Fisheries of Canada, Newfoundland Area, St. John's, Nfld.). 1965. WATER POLLUTION AND FISH POPULATIONS IN THE PROVINCE OF NEWFOUNDLAND AND LABRADOR IN 1964. The Canadian Fish Culturist, Issue 35, pp. 3-15.

It is concluded that the province of Newfoundland and Labrador is no longer the pollution free area that it has sometimes been considered. Although fish populations and water pollution have been the theme of this report, it seems that the situation in some areas is such that unless reasonable foresight is exercised, and proper precautionary measures taken, the foreseeable future may see not only valuable fish stocks threatened, but perhaps other water resources uses also being unnecessarily jeopardized.

8272. Gordon, R.N. (Resource Develop. Branch, Dept. of Fisheries, Pacific Area, Vancouver, B.C.). 1965. FISHERIES PROBLEMS ASSOCIATED WITH HYDROELECTRIC DEVELOPMENT. The Canadian Fish Culturist, Issue 35, pp. 17-36.

Pacific salmon are so sensitive to changes in their natural environment that even slight abnormalities can result in heavy losses or extinction. For this reason, hydroelectric developments which divert, disrupt, or otherwise interfere with the salmon's environment can introduce problems which are rooted much deeper than the obvious one of having to provide for their passage around dams. The continuing research which is being directed toward these problems has met with some success, but many of the known problems are still unsolved; and it may be that there are others, of a more subtle nature, which have not yet been detected. The seemingly slow pace of this research might logically raise questions in the minds of engineers in other fields as to why it takes so long to define the problems, let alone to develop their solutions. The answers, of course, lie in the fact that the problems cannot be solved by engineering principles alone. They are fundamentally biological problems relating to a living animal, and before the engineer can come to grips with the individual problems he must have the answers to many questions. Until such time as these important questions in the field of biology are answered, the effects which individual hydro proposals could have on the salmon stocks cannot always be accurately predetermined. (From Auth. summ.)

8273. Stocek, Rudolph F. (Dept. of Recreation, Philadelphia, Penn.), and Hugh R. McCrimmon. 1965. THE CO-EXISTENCE OF RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) AND LARGEMOUTH BASS (MICROPTERUS SALMOIDES LACEPEDE) IN A SMALL ONTARIO LAKE. The Canadian Fish Culturist, Issue 35, pp. 37-58.

A sport fishery was maintained between 1958 and 1962 in a 41.7 acre lake by annual plantings of yearling hatchery-reared rainbow trout and the natural reproduction of introduced largemouth bass. Because of unfavourable summer limnological conditions in the hypolimnion and lower thermocline, both species were obliged to co-exist in the upper 10-15 feet of surface water. An average annual fishing pressure in 1961-62 of 155 angler-hours per surface acre harvested 5.1 trout and 5.5 bass, or 4.6 pounds of these species per surface acre. Angling success was 0.05 bass and 0.06 trout per angler-hour. Factors affecting the survival, distribution, and fishing quality of both species are discussed.

8274. Johnson, M.G. (Metropolitan Toronto and Region Conservation Authority), and A. H. Berst. 1965. THE EFFECT OF LOW-LEVEL DISCHARGE ON THE SUMMER TEMPERATURE AND OXYGEN CONTENT OF A SOUTHERN ONTARIO RESERVOIR. The Canadian Fish Culturist, Issue 35, pp. 59-66.

The distribution of heat in Fanshawe Lake during several summers of surface discharge is compared with that during one summer when a low-level discharge was used. In the years before 1963,

when the water was drawn from the surface, temperatures of 75 and 55°F. were typical of the epilimnion and hypolimnion respectively and stratification persisted from June through August. There was no appreciable rise in temperature of the hypolimnion until late summer when the surface temperature fell to 70°F. and stratification began to break down. The occasional slight rise in temperature of the hypolimnion observed during mid-summer was obviously correlated with a temporary drop in the surface temperature to less than 70°F. However, in 1963, when the water was drawn from the low-level outlet, the temperature of the hypolimnial waters reached 60° F. in late June and remained between 60 and 65° F. throughout July and August. Hypolimnial water was apparently mixed with and replaced by warmer, epilimnial water that year. During the years before 1963 a considerable proportion of the volume of Fanshawe Lake became deoxygenated (15%) and a large volume (45%) was less than one-half saturated with oxygen by mid-summer. In 1963 the oxygen content of the lake was maintained because of the breakdown in thermal stratification. Only a very small proportion of the lake (1%) was deoxygenated and only 20% was less than half saturated with oxygen. Fanshawe Lake is characteristically eutrophic. Algal blooms have curtailed swimming periodically and the unsuitability of a significant portion of the lake for fish has been noted above. Ordinarily these conditions might be expected to become worse from one year to the next. However, as Murphy (1962) has stated, the productivity of reservoirs would be increased by the withdrawal of surface waters, containment of the richer hypolimnial water and maintenance of a shallow, well illuminated epilimnion, whereas low-level withdrawal would have the opposite effect. The regeneration of nutrients from the sediments to hypolimnial waters is widely recognized and, as might be expected, the greatest concentrations of total phosphorus, nitrogen and hardness were found in samples from the hypolimnion of Fanshawe Lake. (Auth. summ.)

8275. Díaz, Enrique L. (Inter-American Tropical Tuna Comm., Scripps Inst. of Oceanography, La Jolla, Calif.). 1965. BIBLIOGRAPHIC MATERIAL ON THE FISHES OF COLOMBIA AND NORTHWESTERN SOUTH AMERICA. FAO Fisheries Technical Paper No. 53. 72 p.

8276. Cairns, John Jr., and Arthur Scheier (Acad. of Natural Sciences of Philadelphia, Pa.). 1963. ENVIRONMENTAL EFFECTS UPON CYANIDE TOXICITY TO FISH. Notulae Naturae, No. 361 (Acad. Natural Sciences of Philadelphia), 11 p.

Bioassays were carried out using Lepomis macrochirus Raf. as a test organism in hard and soft synthetic dilution waters with KCN as the test material. These tests were carried out at 18°C. and 30°C. to see whether or not hardness and/or temperature affected the toxicity of cyanide to the test organism. Comparisons of results for the 96 hour TLm's (LD_{50}) were made and checked with the statistical method of Litchfield and Wilcoxon.

8277. Anonymous. 1965. DISPERSION AND PERSISTENCE OF SYNTHETIC DETERGENTS IN GROUND WATER, SAN BERNARDINO AND RIVERSIDE COUNTIES. State Water Quality Control Board Publication No. 30, Sacramento, Calif., 45 p. Maps.

In August 1960, operators of wells in the Colton Narrows area of the Santa Ana River of Southern California noticed foaming in their irrigation water. This situation led to investigations resulting in a research project. The general objectives of the investigation were: (1) To assist the Santa Ana Regional Water Pollution Control Board in the conduct of its regulatory responsibilities; (2) To determine the fate of synthetic detergents percolating into ground waters; (3) To develop fundamental data to aid in the evaluation of mixing and dispersion within a ground water basin. To attain these objectives the following determinations were made: the areal extent of ABS concentration in the Colton Narrows area and the changes occurring during the period of investigation, the concentrations of ABS reaching the ground water by percolation through the unsaturated zone, dispersion of synthetic detergents in the ground water body, extent of vertical mixing of ABS in the ground water body, and persistence of synthetic detergents in ground water.

8278. Mann, K.H. (Dept. of Zoology, The University, Reading, England). 1965. ENERGY TRANSFORMATIONS BY A POPULATION OF FISH IN THE RIVER THAMES. The Journal of Animal Ecology, 34(2): 253-275.

The paper describes a bioenergetic approach to the study of the quantitative relationship between fish and their food. The oxygen consumption of representative species and sizes of fish from the Thames was determined in spring, summer and winter at the temperature of the river in a continuous-flow respirometer. The data collected by Williams (1963) were combined with oxygen uptake figures to provide estimates of the yearly energy requirements of the fish for growth and metabolism. Growth and mortality were allowed for by a process of integration carried out on a computer. The biomass of fish present in the Thames was estimated at 659 kg/ha, probably the highest figure recorded for a river, and seldom exceeded in any natural habitat in temperate climates. Annual production is estimated as 426 kg/ha, or 65% of the standing crop. If this production were converted to yield it would compare favourably with man's harvest from most natural habitats and unfertilized fish ponds. Potential ecological efficiency is of the order of 6%, which is at the low end of the range predicted by Slobodkin (1960). This low figure is attributed to the scarcity of fish predators so that the river is densely populated and the fish are slow growing. The estimated annual energy requirement of the fish population is 704·5 kcal/m^2. This energy is derived from rooted plants, algae, benthic invertebrates, detritus and drift but it is not possible at this stage to say how much is derived from each source. (From Auth. summ.)

8279. McCormack, Jean C. (Freshwater Biological Assoc., Ambleside, Westmorland, England). 1965. OBSERVATIONS ON THE PERCH POPULATION OF ULLSWATER. The Journal of Animal Ecology, 34(2): 463-478.

The perch population of Ullswater was studied because there are no pike in Ullswater and the perch are larger and less abundant than those in Windermere, although the two lakes are physically similar and in the same district. Samples were caught in traps, seines and gill-nets from 1948 to 1957. Age and growth were determined from the opercular bone. The bone length/fish length relationship was similar to that for perch in Windermere. Trapped samples taken during spawning had a preponderance of males but seined samples suggested that the real sex-ratio was near unity. The 1947 and 1949 year-classes dominated the population during the period of investigation. The estimated total mortality rates for males of the 1947 and 1949 year-classes were 0.73 and 0.56 respectively. That for the 1949 year-class is significantly greater than the mortality rate for the same year-class in Windermere. The exponent in the length-weight relationship did not differ significantly from 3, but was significantly different for the two sexes. It is different from that for perch in Windermere. Unlike that in Windermere the growth of Ullswater perch followed the von Bertalanffy formula rather well with an l_∞ of 20.8 cm for females. Small numbers of exceptionally large perch occur in Ullswater and have an l_∞ of about 45 cm. (Auth. summ.)

8280. Bell, Robert J. 1965. FISH RESTORATION ON THE CLEARWATER. Idaho Wildlife Review, 18(1): 3-6.

Results obtained from many spawning and hatching channels in the Northwest and Canada have been very encouraging. They are considered a valuable supplement to salmon and steelhead hatcheries and a promising new management tool in the anadromous fisheries field. While not the final solution to salmon and steelhead propagation, by any means, it is felt they are a step in the right direction.

8281. Marshall, Nelson (Graduate School of Oceanography, Univ. of Rhode Island, Kingston), and Bernice M. Wheeler. 1965. ROLE OF THE COASTAL AND UPPER ESTUARINE WATERS CONTRIBUTING PHYTOPLANKTON TO THE SHOALS OF THE NIANTIC ESTUARY. Ecology, 46(5): 665-673.

Niantic Bay and the estuarine basin of the Niantic River were studied as source areas of phytoplankton transported across the shoals which separate the upper estuarine basin from the coastal waters and which support dense populations of bay scallops and other benthic filter feeders. Surface and bottom stations in the Bay and estuarine basin and two stations over the shoals, where tidal excursions alternately transport water from offshore and from the estuary, were sampled at 5-week intervals for 1 year. Dinoflagellates predominated in the basin of the estuary and, to a lesser extent, were significant seaward into the Bay. The diatoms were most abundant in the Bay where they followed population trends characteristic of Long Island Sound and coastal waters. Two species of chrysophyceans were abundant, cheifly restricted to these near-shore waters but showing no indications that either the Bay or the more confined estuarine waters were more favorable. When the Bay was the predominant phytoplankton source area, as judged by the counts and population trends, the plankton of the mixed waters over the shoals was similar to that of the Bay in kind and in numbers. When the basin was the predominant source area, the plankton over the shoals, though similar in kind, commonly dropped to one-tenth the abundance found up-estuary. This drop may relate to the vertical migration of the flagellates into deeper waters which do not flow freely across the shoals. The lower plankton counts over the shoals may also result from the mixing of the waters ebbing from the basin with the relatively large volume of water over the shoals following the high tide. In the basin of the estuary the phytoplankton volume fluctuated around a mean of 6.90 mm^3/liter. The average for Bay was 0.23 mm^3/liter. Over the shoals the average was 0.63 toward the upper estuary and 0.45 toward the Bay. These averages and other data constitute evidence that the upper estuarine area contributes more phytoplankton to the shoals than do the offshore waters.

8282. Schwartz, F. J., and R. Jachowski (Univ. of Maryland, Natural Resources Inst., Chesapeake Biol. Lab., Solomons, Md.). 1965. THE AGE, GROWTH, AND LENGTH-WEIGHT RELATIONSHIP OF THE PATUXENT RIVER, MARYLAND ICTALURID WHITE CATFISH, ICTALURUS CATUS. Chesapeake Science, 6(4): 226-237.

The age and growth of 470 white catfish captured in 1963 from the Patuxent River near Trueman Point, Maryland, was examined. Annual growth increments varied 25-45 mm. Oldest river specimens were 12 years. The largest known Maryland specimen from a freshwater millpond was 14 years old. Length back calculations at each age were possible by the curved vertebral-fish length relationship formula $Y = 63.21 + 89.64X + .01X^2$. The length-weight relationship for the same specimens was best exemplified by the log formula $\log Y = -.9791 + .1689 \log X$. In each case Patuxent specimens were shorter lived, shorter, and weighed less than those from other parts of its natural or introduced range.

8283. Rimes, Les. 1965. SPAWNING CHANNEL OPENED ON BABINE LAKE. Canadian Fisherman, 52(12): 11-12.

A new artificial spawning stream, opened in mid-October, completed Phase One of a $5,000,000 five year project to increase sockeye salmon production in Babine Lake, British Columbia.

8284. Spence, K. D. (Dept. Microbiology, Oregon State Univ., Corvallis), J. L. Fryer, and K. S. Pilcher. 1965. ACTIVE AND PASSIVE IMMUNI-

ZATION OF CERTAIN SALMONID FISHES AGAINST AEROMONAS SALMONICIDA. Canadian Jour. of Microbiology, 11: 397-405.

Passive protection against Aeromonas salmonicida, the causative agent of furunculosis in fishes, was produced in juvenile coho salmon by administration of serum from adult rainbow trout containing antibodies actively produced by intra-abdominal vaccination. The levels of natural (or residual) agglutinins against A. salmonicida and those produced by vaccination are shown for two age-groups for rainbow trout. Oral vaccine administered in the diet of juvenile coho salmon failed to produce either agglutinating antibody or protection against experimental infection under the conditions employed.

8285. Regier, Henry A. (Dept. of Conservation, Cornell Univ., Ithaca, New York). 1963. ECOLOGY AND MANAGEMENT OF LARGEMOUTH BASS AND GOLDEN SHINERS IN FARM PONDS IN NEW YORK. New York Fish and Game Journal, 10(2): 139-169.

Experiments with largemouth bass and golden shiners were conducted in farm ponds in central New York, and the results were compared with those from experiments with largemouth bass and bluegills. Natural mortality of originally stocked bass was somewhat lower in bass-shiner ponds than in bass-bluegill ponds. Growth rates of bass were somewhat higher in bass-shiner ponds. Bass reproduction was more regular in the bass-shiner ponds. Therefore, standing crops of bass tended to be considerably higher in bass-shiner ponds, permitting larger harvests. In spite of satisfactory initial reproduction and suitable spawning sites, shiner populations began to decline 2 years after stocking and disappeared in some ponds, presumably due to predation. Standing crops of bass increased and bass reproduction continued, in spite of decreasing shiner populations. Stocking with the bass-shiner combination should be encouraged on a trial basis in New York ponds. This combination may be more advantageous than bass and bluegills for the pond owner who is not particularly interested in bluegills and whose pond is quite small and fairly shallow with a surface temperature that rises above about 73° F. in summer.

8286. Regier, Henry A. (Dept. of Conservation, Cornell Univ., Ithaca, New York). 1963. ECOLOGY AND MANAGEMENT OF CHANNEL CATFISH IN FARM PONDS IN NEW YORK. New York Fish and Game Journal, 10(2): 170-185.

Experiments with channel catfish were conducted in farm ponds in central New York. This species does not appear to hold much promise for general stocking in New York farm ponds because it is difficult to produce cheaply and in large numbers for stocking purposes; survival and reproduction of stocked fish were poor in most project introductions; and the unpredictability of survival and of reproduction implies that harvest quotas would be unpredictable.

8287. Forney, John L., and Charles B. Taylor. (Dept. of Conservation, Cornell Univ., Ithaca, New York). 1963. AGE AND GROWTH OF WHITE BASS IN ONEIDA LAKE, NEW YORK. New York Fish and Game Journal, 10(2): 194-200.

Age and growth determinations were made from scales of 628 white bass collected from 1956 through 1961. During these years the 1954 year class comprised 85 percent of the catch in experimental gill nets. Mean calculated total lengths of white bass were 5.3, 10.3, 12.3, 13.3 and 14.0 inches for ages I through V. Fish and aquatic insects were the food items most frequently found in the stomachs of white bass during summer.

8288. Tiemeier, O. W., C. W. Deyoe, and S. Wearden. 1965. EFFECTS ON GROWTH OF FINGERLING CHANNEL CATFISH OF DIETS CONTAINING TWO ENERGY AND TWO PROTEIN LEVELS. Trans. Kansas Acad. Sci., 68(1): 180-186.

Excellent rates of survival (96.77 percent) were obtained with all diets from April to September. Growth and conversion with a low protein and low energy diet was significantly lower than performances from the other diets. Cool weather during part of August reduced gain (to a loss in one instance) during a 2-week period. A sparing effect of carbohydrate on protein was obtained in the low protein and high energy diet compared with the low protein and low energy diet but the sparing effect was not noted in diets which contained 35 percent protein. Feed cost to produce a pound of fish varied from 6.90 to 12.84 cents among the 4 diets.

8289. Cartier, John O. 1966. LOOK TO THE LAKES FOR TROUT. Outdoor Life, 137(4): 40-41, 114, 116-119.

Thirty-eight states have programs for stocking stream trout in lakes, and four others plan to initiate such programs. Trout in some lakes put on more growth than most other species. Michigan found that a three-inch trout fingerling planted in the spring will be 14 to 16 inches long by the end of the next summer. Hatchery trout planted in lakes have better survival and faster growth than those planted in streams. Spawning requirements makes artificial stocking necessary in most lakes. Some lakes can best be managed for trout only, while others can provide suitable habitat for both trout and warmwater species. Maine studies show only a 5 percent survival to one year of naturally hatched trout. Hatchery trout show a much better survival. Wisconsin finds that some lakes show good survival but poor growth, others provide 18- to 20-inch fish in 3 years, and still others, apparently similar, have shown very poor results. Lakes provide the only trout water in some states such as North Dakota. It seems inevitable that in the future lakes and impoundments will play a large port in trout management programs, and receive a greater share of stocked trout, in most of the states.

8290. Latta, William C., and Reginald F. Sharkey. (Inst. for Fish. Research, Michigan Dept. of Conservation, Vanderbilt). 1966. FEEDING BEHAVIOR OF THE AMERICAN MERGANSER IN

CAPTIVITY. Journal of Wildlife Management, 30(1): 17-23.

In 1962, two American mergansers (Mergus merganser americanus) and in 1963, six were held in captivity for 49-69 days to study feeding behavior. In both years and for all birds, the amount of fish consumed per bird per day equaled 17.9 - 26.8 % of the mean weight of the birds. However, all except three of these captive mergansers continually lost weight. Three birds maintained their body weight for 49-51 days on a daily ration of 6.02 to 6.62 ounces of fish — 18.3 to 19.6 % of mean bird weight. Three different series of tests were made on size of trout selected in feeding the mergansers. When presented with live trout 4-8 inches long, the mergansers showed a preference for the smaller trout over the larger ones. Two series of tests were made to determine the upper limit in size of trout that mergansers can eat. Girth rather than length of trout seemed critical. The largest merganser (60 ounces) was able to consume a trout with a girth of 6.2 inches, while the smallest merganser (33 ounces) could swallow trout with girth of up to only 4.9 inches. In 1963, equal numbers of mottled sculpins (Cottus bairdi), creek chubs (Semotilus atromaculatus), and brook trout (Salvelinus fontinalis) of approximately the same size were presented to four mergansers to determine if there was selection of a particular species for consumption. The mergansers consumed about equal numbers of creek chubs and brook trout but a few less of mottled sculpins.

8291. Teeter, James W. (Utah Coop. Wildlife Research Unit, Utah State Univ., Logan). 1965. EFFECTS OF SODIUM CHLORIDE ON THE SAGO PONDWEED. Journal of Wildlife Management, 29(4): 838-845.

Sago pondweed (Potamogeton pectinatus) at several stages of growth were subjected to various NaCl solutions to determine the influence of the NaCl concentrations on the plant growth and reproduction. Data obtained indicated that the tap water treatment produced maximum vegetative growth and seed production. Increasing NaCl solutions produced a proportional adverse effect upon the vegetative growth and seed production, but a NaCl concentration of 3,000 ppm stimulated the production and growth of tubers. Saline conditions above 9,000 ppm NaCl completely inhibited the growth of 1-week-old plants. Plants which were 4-8 weeks of age could produce new growth in NaCl concentrations of 12,000 ppm, but a concentration of 15,000 ppm reduced growth completely and proved fatal to many plants. The tap water treatment was shown to produce the maximum seed germination success, and a NaCl concentration of 3,000 ppm reduced the germination success by 50 percent. Concentrations above 15,000 ppm NaCl inhibited germination, but a 15 percent germination success could be obtained if the seeds were placed in tap water following the NaCl treatment for 28 days. Sago pondweed tubers exposed to NaCl concentrations of 3,000 ppm produced more new growth and more rhizome shoots than the tubers in any other treatment, indicating that the tubers obtained some beneficial effect from the low saline environment.

8292. Davis, Gerald E., and Charles E. Warren. (Dept. of Fisheries & Wildlife, Oregon State Univ., Corvallis). 1965. TROPHIC RELATIONS OF A SCULPIN IN LABORATORY STREAM COMMUNITIES. Journal of Wildlife Management, 29(4): 846-871.

The trophic relations of the sculpin Cottus perplexus in simplified communities were studied in six laboratory streams. The laboratory streams, even though provided with filtered stream water, were colonized by algae and small herbivorous insects as a result of the entrance of some organisms or their reproductive cells with the water. The sculpin and the stonefly naiad Acroneuria pacifica, both carnivores, and the snail Oxytrema silicula, a herbivore, were added to the streams in different combinations and quantities. The herbivorous insects and snails utilized algae for food, and the sculpins and stonefly naiads utilized herbivorous insects for food. By stocking the streams with different biomasses of sculpins, it was possible to study the influences of intraspecific competition for food on the food consumption and production of the sculpins. Food consumption and production were low when sculpin biomasses were low or high, and they were maximal when the biomasses were intermediate. The low food consumption observed when biomasses were high resulted from overutilization of the food resource. This and increases of the maintenance requirements of the sculpin populations were the factors responsible for the reduced production obtained when biomass levels were high. The influences of interspecific competition for food on the food consumption and production of the sculpin were studied by stocking the laboratory streams with different biomasses of sculpins and stonefly naiads. The stonefly naiads were able to crop the common food resource more efficiently than could the sculpins, and the presence of stoneflies in the streams reduced both the food consumption and the production of the sculpins. The effects of both intraspecific and interspecific competition were to increase the fraction of food utilized for maintenance and reduce the fraction utilized for growth of sculpins.

8293. George, John L. 1965. PESTICIDE-WILDLIFE STUDIES BY STATES, PROVINCES, AND UNIVERSITIES. AN ANNOTATED LIST OF INVESTIGATIONS THROUGH 1964. U.S. Fish and Wildlife Service Circular 224. 30 p.

8294. Moore, Harry H., and Robert A. Braem. (Bur. of Commercial Fisheries, Ann Arbor, Mich.). 1965. DISTRIBUTION OF FISHES IN U.S. STREAMS TRIBUTARY TO LAKE SUPERIOR. U.S. Fish and Wildlife Service , Special Scientific Report — Fisheries No. 516. 61 p.

Experimental sea lamprey control by the Bureau of Commercial Fisheries on Lake Superior streams provided many new distributional records of the fish fauna. Seventy-one species were recorded from 175 streams. Specimens were collected at the electromechanical barriers, with electric shockers, with

fyke nets, and during chemical treatment of streams. Maps showing stream records of each species are presented.

8295. McLain, Alberton L., Bernard R. Smith, and Harry H. Moore (Bur. of Commercial Fisheries Biological Station, Marquette, Mich.). 1965. EXPERIMENTAL CONTROL OF SEA LAMPREYS WITH ELECTRICITY ON THE SOUTH SHORE OF LAKE SUPERIOR. Great Lakes Fishery Comm. Technical Report No. 10. 48 p.

Experimental control of the sea lamprey, Petromyzon marinus, with electric barriers was begun in Lake Superior in 1953. Electrical devices were the most practical and promising method of control then available. Installed below grounds in streams and rivers tributary to Lake Superior, these barriers were designed to prevent the sexually mature sea lampreys from reproducing. The catch of sea lampreys at the electric barriers increased rapidly from 1,668 in 1953 to 66,931 in 1958. The total catches dropped substantially in 1959 and 1960 to 52,173 and 39,783, respectively. Electric fields of sufficient intensity to block sea lampreys were potentially lethal to other fish and caused undesirable mortality. Improvements in design and installation, and the development of a direct-current diversion device reduced the mortality and increased the efficiency of operation. The development of control by selective chemicals in 1958 superseded the barrier control system which was terminated at the end of the 1960 season. The electric barrier operation provided considerable information on mature sea lampreys, including data on time of migration, length, weight, and sex composition. Electric devices of the type and design used are capable of blocking entire runs of adult sea lampreys. An accurate appraisal of the effectiveness of the barrier system is impossible, however. Most of the barriers were not operated long enough to reduce the contribution of parasites from the streams. Furthermore, a complete system of efficient electric barriers was never realized. The greatest weakness of this method of control lies in maintenance of the units in continuous, uninterrupted operation through consecutive migratory seasons.

8296. Gooding, Reginald M. (Bur. of Commercial Fisheries Biological Lab., Honolulu, Hawaii). 1965. A RAFT FOR DIRECT SUBSURFACE OBSERVATION AT SEA. U.S. Fish and Wildlife Service, Special Scientific Report — Fisheries No. 517. 5 p.

A raft with an underwater chamber was constructed to allow close study of the accumulations of fishes around a floating object at sea. A mother vessel carries the raft to the observation site and sets it adrift. The observation chamber accommodates one observer, who has a 360° view of the surrounding water. New information on fish behavior and ecology was gathered during several short drifts near the island of Hawaii and two drifts of 8 and 9 days in the equatorial Pacific.

8297. Lopinot, Alvin C. (Dept. of Conservation, Springfield, Illinois). 1965. (Revision). FISH CONSERVATION TEACHER'S MANUAL. Illinois Division of Conservation Education, Office of Supt. of Public Instruction. 94 p.

History of the fishery resources, basic limnology, and brief description of the common fishes of the State. Considers management of sport and commercial species, bait fish propagation, and lake construction.

8298. Lin, Shu-yen. 1965. INDUCED SPAWNING OF CHINESE CARPS BY PITUITARY INJECTION IN TAIWAN (A SURVEY OF TECHNIQUE AND APPLICATION). Chinese-American Joint Comm. on Rural Reconstruction, Fisheries Series No. 5. 31 p.

The discovery of natural spawning of the silver carp, big head and grass carp in a reservoir of Taiwan led to intensive study of their life histories, population dynamics, hatching of eggs and rearing of fry by Tang in 1960, and led to experiments on the induced reproduction by pituitary injection with success in 1962. Many more experiments on pituitary injection were made in 1963 and 1964 with ever increasing percentage of success by fish culture stations and fish farmers through technique improvement. Establishment of commercial hatcheries began in 1964 for artificial propagation of silver carp, big head, grass carp and mud carp by induction with pituitary hormone and consequently in 1965 more than 30 such establishments of various scales sprang up. A careful survey of the techniques and procedures employed by these establishments in Taiwan shows the dosages of fresh common carp pituitary boosted with or without synahorin which give the best result in ovulation.

8299. Hamilton, Lawrence S., and E.T. Van Nierop. 1965. SHOULD WE FISH AND BOAT ON OUR RESERVOIRS? The Conservationist, New York State Conservation Dept., 20(2): 12-14.

A sample survey of the recreational use of the reservoirs of 95 municipalities in New York showed that public health, economic, and legal considerations complicate such use of water supplies. Twenty-five of the municipalities studied permit fishing.

8300. Hoffman, Glenn L. (Bur. Sport Fisheries and Wildlife, Eastern Fish Disease Laboratory, Leetown, West Virginia). 1965. EIMERIA AURATI N. SP. (PROTOZOA:EIMERIIDAE) FROM GOLDFISH (CARASSIUS AURATUS) IN NORTH AMERICA. The Jour. of Protozoology, 12(2): 273-275.

Eimeria aurati n. sp. is described from the intestine of the goldfish, Carassius auratus, from Pennsylvania, U.S.A. Oocysts were very numerous in long, whitish, opaque fecal casts. They were 16 to 24 by 14 to 17 μ (mean, 20.1 by 16.3) and were non-sporulated when passed but sporulated 2 to 5 days later.

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☆ U.S. GOVERNMENT PRINTING OFFICE : 1966 O—219-146

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